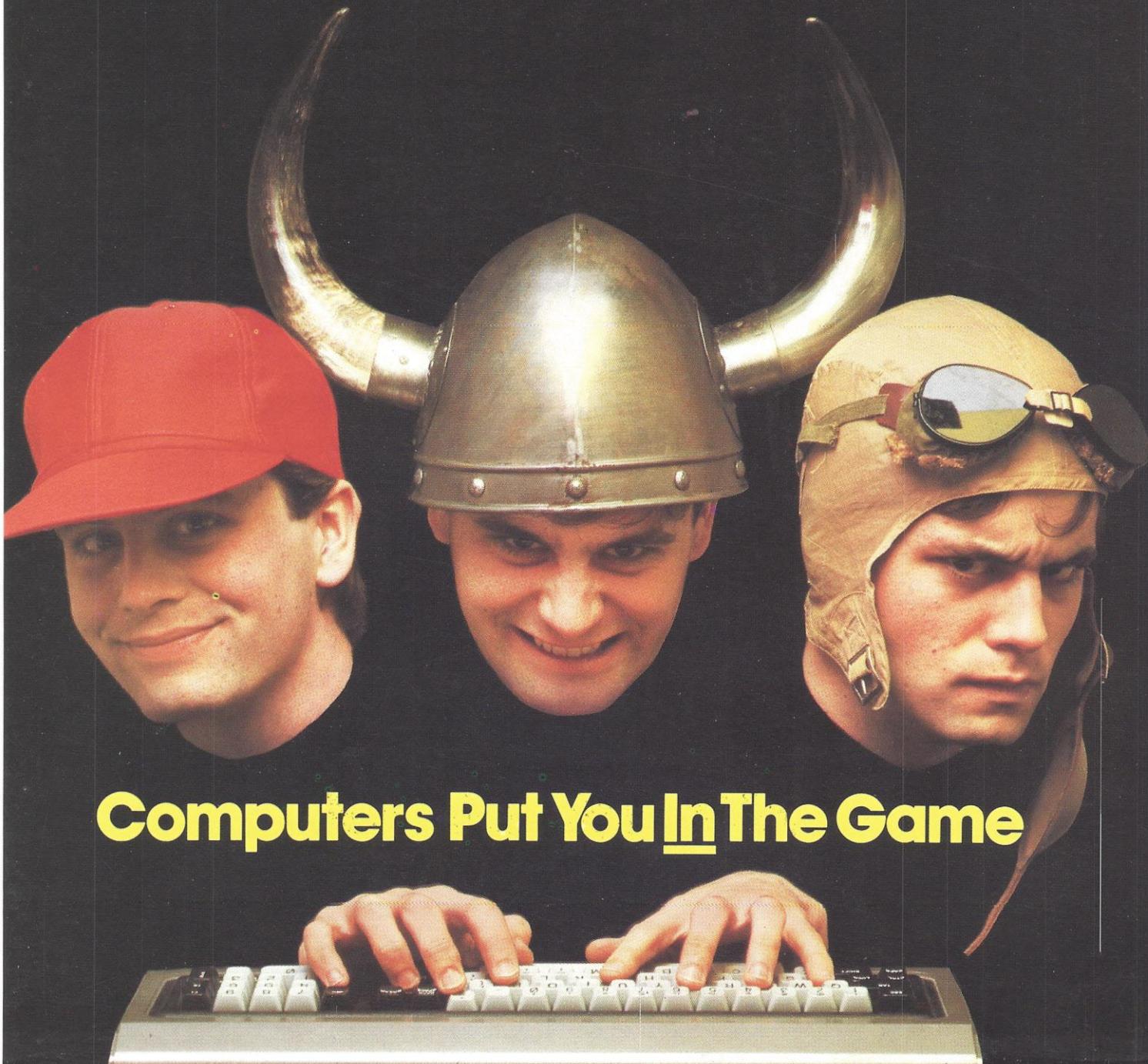


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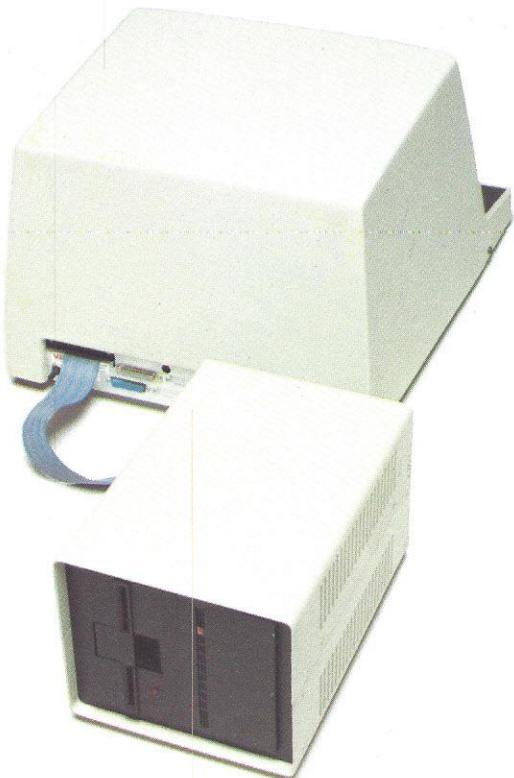
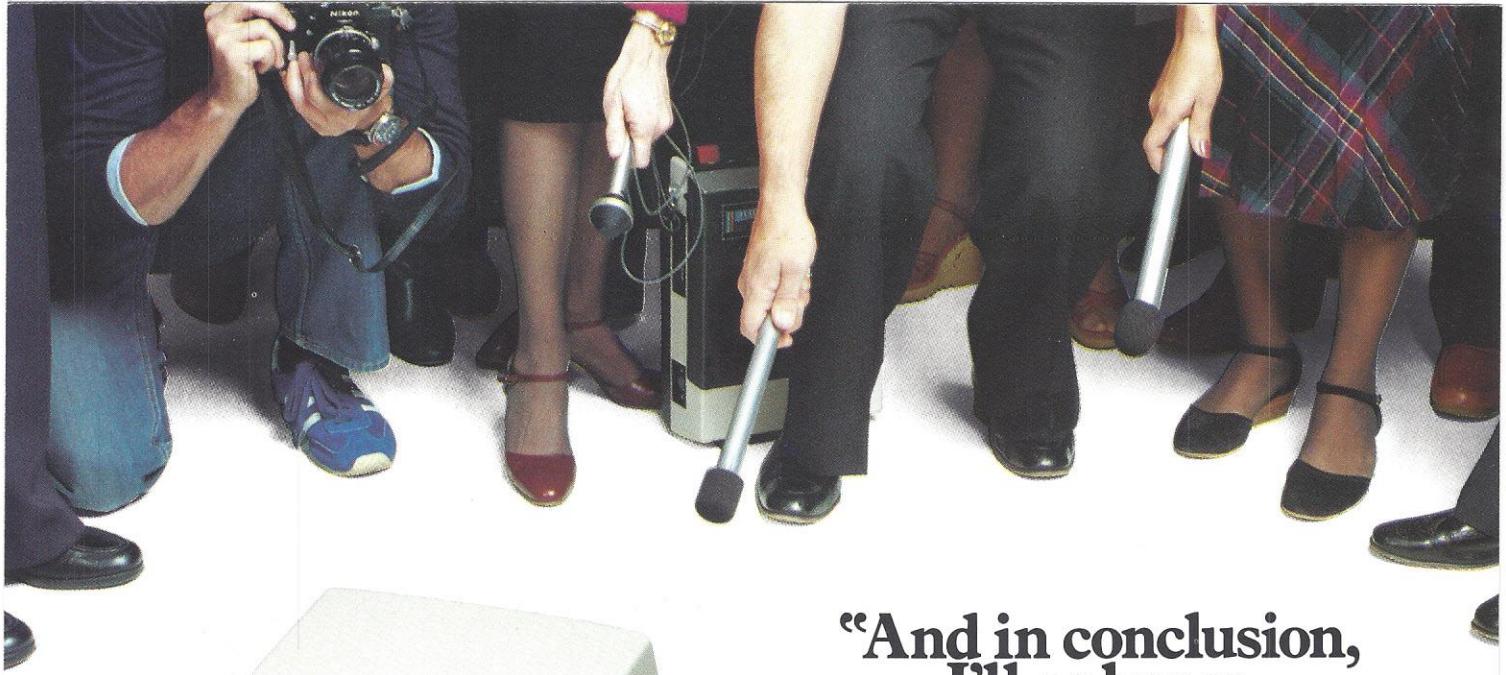
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Stock-Market Analysis By Computer



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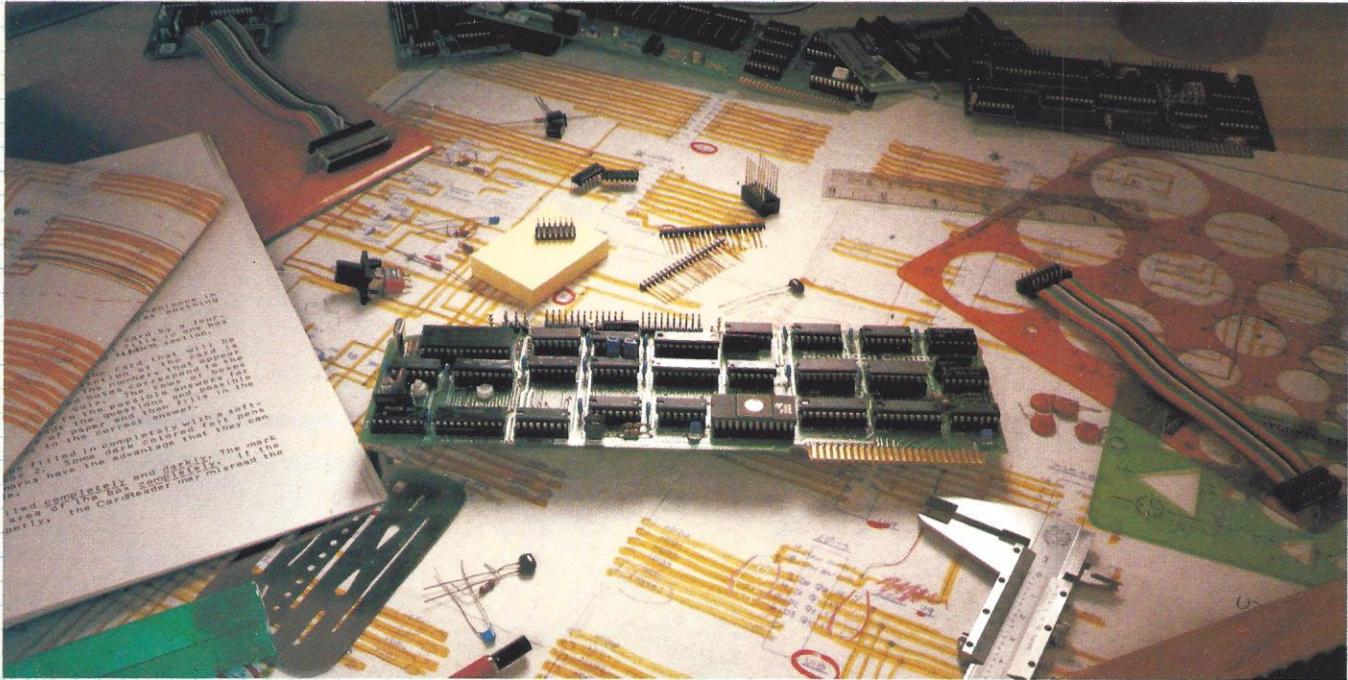
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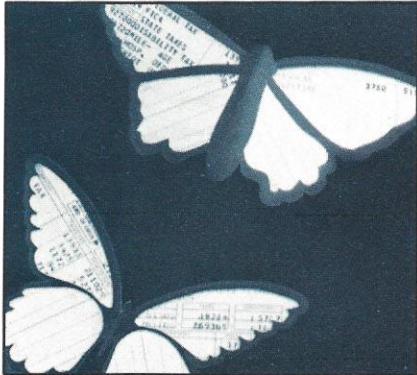
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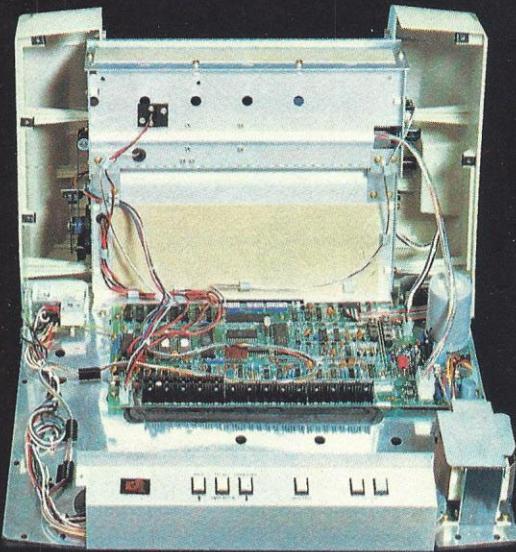
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BY PAUL BIERMAN AND LAURIE SPIEGEL Many people would like to play music on their computers. But they have to learn the language of music first. This primer on computer music provides some basic definitions.

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Data Base Addition

Dear Editor:

I was eager to read "How to Choose Data Base Management Programs" in the February 1981 issue because data base managers for TRS-80 16K tape systems are scarce. I purchased PIMS a year ago and modified it to meet my needs. As you noted in your article, the major drawback with PIMS is the sort routine.

In December, I purchased Super-PIMX from CIE People's Software. The major asset of the program is the machine language sort. I can now sort 75 records in seven seconds versus 10 minutes with PIMS. The program is modular and well documented so a novice programmer can modify it to his needs easily. Also, the initial tape I received was defective. A call to CIE provided a prompt response and a new tape. I was grateful for the support.

Jan Stanczak
Strongsville, OH

Programs Sought

Dear Editor:

Our firm, Suncoast Micro-Systems, is a private, not-for profit corporation with a primary objective to assist in the development and placement of microcomputer systems within community-based public service and charitable organizations. In our view, development of microcomputer systems within this market sector has been impeded by existing funding regulations and a lack of familiarity with computers among both governmental funders and local agency personnel alike. We intend to assist in bridging that "gap" by pro-

viding information and assistance to local public service agencies that have an interest in microcomputer applications.

We need your help! We are certain that similar organizations exist in other parts of the country, but to date we have been unable to access them.

We seek contact and collaboration with other non-profit groups that are trying to catalyze appropriate software and training materials for community-based agencies.

Joseph J. Spatafora
Senior Associate
Suncoast Micro-Systems
1870 Sailfish Rd.
St. Petersburg, FL 33707

Analysis Correction

Dear Editor:

I would like to add my thanks to you and to Mikel Aickin for his interesting and useful article "Regression Analysis" (January 1981); also to R.D. Biggs and Gordon Kirchhevel for their contributions (Feedback, March 1981).

Because one of the more common uses of regression analysis is making projections of the Y value (as in the school district example), I've found the routine in Program Listing 1 to be convenient. It automatically prompts for however many independent variables are specified by "L" and solves for Y.

Messers Biggs and Kirchhevel address themselves to measures of "goodness of fit" and confidence levels. Another such measure in regression analysis is the standard error of the estimate. This is easily derived from Mikel Aickin's program by inserting the following line near the end:

11XX PRINT "STANDARD
ERROR = "; SQR (S1/N)

For those who may not be familiar with it, the standard error of the estimate has some advantages over other popular statistical tests. First, it's stated in terms that are intrinsic to the data under analysis, i.e., in Y units. Second, it "behaves" like the standard deviation (a measure fairly widely understood) except that it measures the deviation of the actual Y values from the Y' values computed by the regression equation. In other words about two thirds of the actual values will be within ± 1 stan-

Program Listing 1: Routine for inputting values of A,B,C...T and computing Y' (YP).

```
1110 GOSUB 1500
1490 REM PROJECTION ROUTINE
1500 YP = 0
1510 FOR I = 2 TO L
1520 PRINT
1530 PRINT "FOR VARIABLE " CHR$(I + 63)
1540 INPUT "INPUT VALUE.:";EP
1550 YP = YP + EP * S(I*(I - 1)/2 + 1)
1560 NEXT I
1570 YP = YP + Z
1580 PRINT
1590 PRINT "Y (PROJECTED) = ";YP
1600 RETURN
```

Program Listing 2: Routine for calculating and displaying values for YC , $Y - YC$, $(Y - YC)^2$, means and sums and the standard error of the estimate.

```
11XX GOSUB 1700
1690 REM ROUTINE FOR COMPUTING
1696 REM STANDARD ERROR OF
1698 REM THE ESTIMATE
1700 PRINT
1705 PRINT "Y VALUE"; TAB(10); "YC VALUE"; TAB(20); "DIFF";
    TAB(30); "DIFF 2"
1708 PRINT
1710 RESTORE: D1 = 0:D2 = 0:S1 = 0:S2 = 0:S3 = 0:S4 = 0
1715 FOR I = 1 TO N
1717 YC = 0
1720 FOR J = 1 TO L
1725 READ V(J)
1730 IF J = 1 THEN Y = V(J)
1735 IF J > 1 THEN YC = YC + V(J)*S(J*(J - 1)/2 + 1)
1740 NEXT J
1745 YC = YC + Z
1750 D1 = Y - YC
1760 D2 D1^ 2
1762 S1 = S1 + Y
1764 S2 = S2 + YC
1770 S3 = S3 + D1
1780 S4 = S4 + D2
1790 PRINT Y; TAB(10); INT(YC + .5); TAB(20); INT(D1 + .5);
    TAB(30); INT(D2 + .5)
1800 NEXT I
1805 REM PRINT MEANS AND SUMS
1810 PRINT: PRINT INT(S1/N + .5); TAB(10); INT(S2/N + .5); TAB(20);
    INT(S3 + .5); TAB(30); INT(S4 + .5)
1820 REM STANDARD ERROR CALCULATION
1830 SE = SQR(S4/N)
1840 PRINT: PRINT "STANDARD ERROR = "; SE
1850 PRINT: PRINT "STD. ERROR/Y MEAN = "; SE/(S1/N)
1860 RETURN
```

dard error of the computed values, about 95% will be within ± 2 units, and 99+ % will be ± 3 . From these rather familiar characteristics of the measure, one can draw inferences (very carefully) about the goodness of fit and the validity of projections.

While the above one line "routine" yields the standard error, the value, by itself, leaves a fair amount of work to be done for most useful analysis. Program Listing 2 is a routine I wrote some time ago to take the drudgery out of this sort of analysis, recoded to be compatible with Mr. Aickin's program. Its coded in Applesoft for the school district example; the rounding routines in the print statements may have to be recoded to conform to the range of

data values or precision requirements. Also, I use "YC" in the heading for Y'. "YC" is archaic notation, but I use it to be consistent with the program variable name because the Apple can't digest Y' as a variable name.

Lastly, there appears to be an error in the listing of R.D. Biggs' program in the March 1981 issue. The "RS" value accumulated in line 1032 is known as the coefficient of determination, or r^2 . Since the stated objective of the routine is to derive the coefficient of correlation, or r , line 1055 should read:

1055 PRINT " CORRELATION
COEF = "; SQR(RS)

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Manhattan Beach, CA

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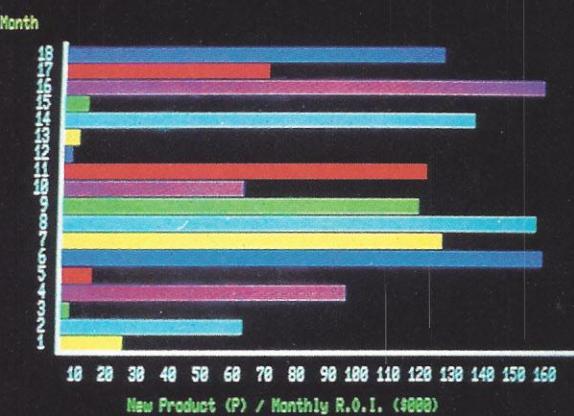
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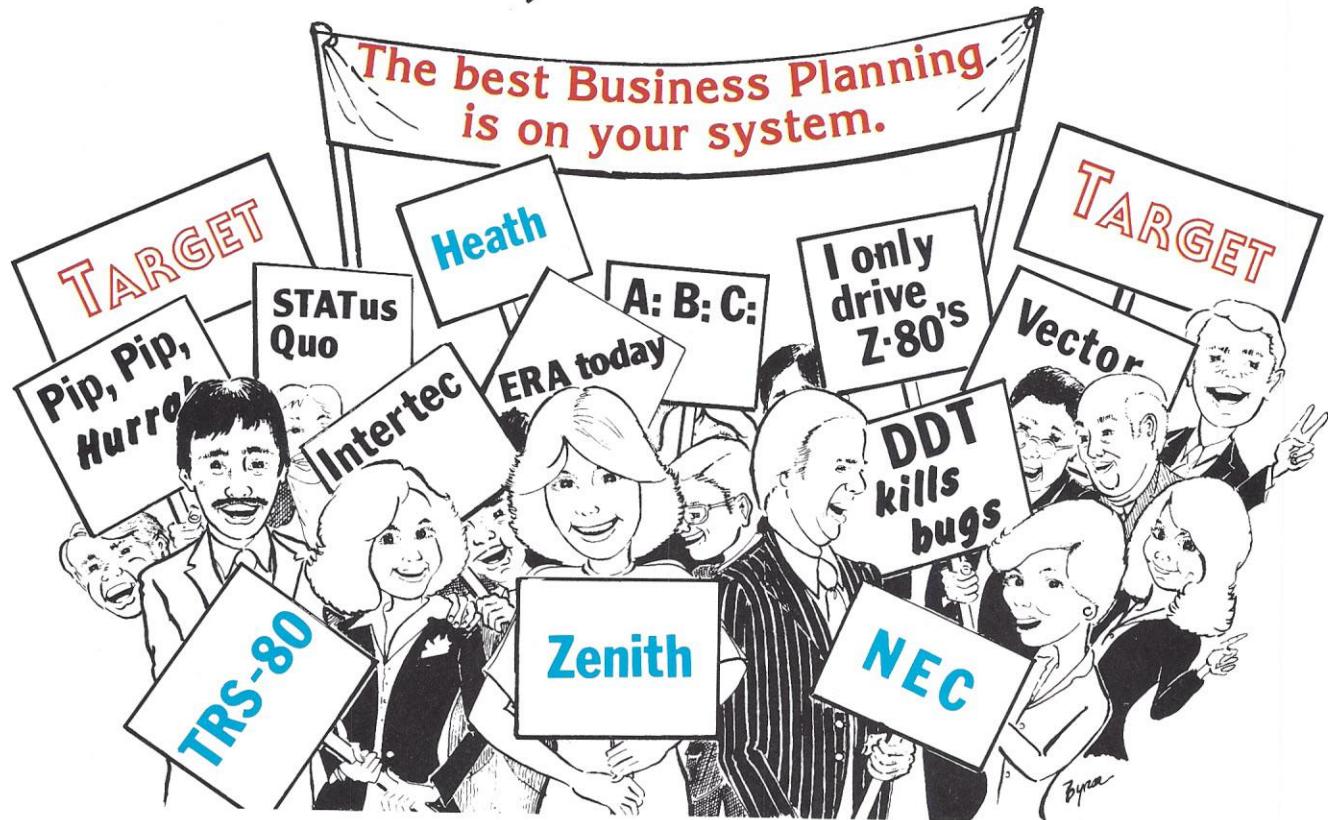
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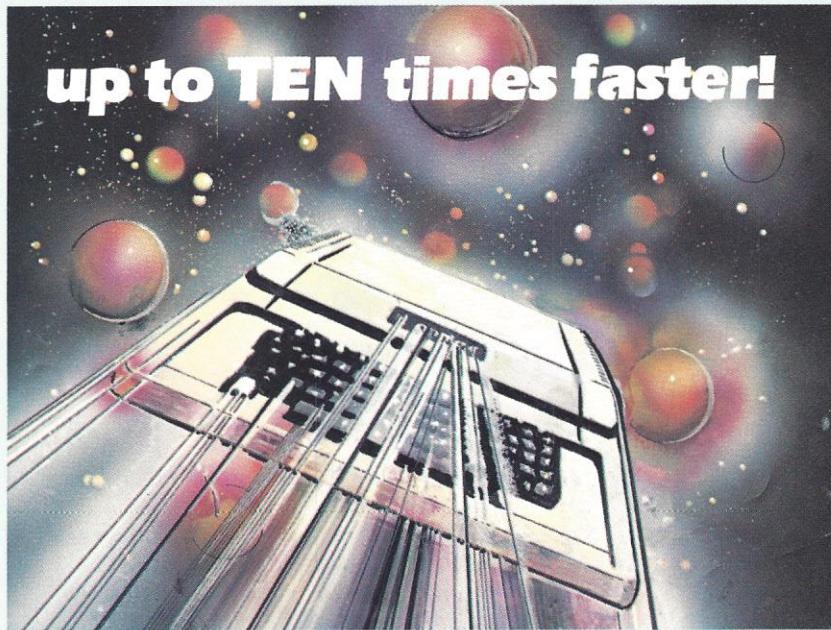
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 01103 01404 02601 03304 03418 04401 05004 05409 07004 09009
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 01203 01413 02801 03403 03444 04503 05103 05601 07101 09409
 01204 02401 02803 03404 03484 04504 05108 05603 07103 09704
 01301 02403 02903 03408 03504 04513 05203 05609 07301 09704
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RENUMBER & APPEND: Utility Programs for the Apple (Gilder) Renumber your Applesoft program and append a second program to the one in memory. **03804, Apple II tape, \$14.95**

REVIVE (Gilder) When a program is accidentally erased, REVIVE searches through memory and finds the information that enables it to restore the pointers that have been changed. **03604, Apple II tape, \$19.95**

SLOW LIST/STOP LIST: Utility Programs for the Apple (Gilder) Start, stop, and control the speed of your program with Apple II's game paddles. **03904, Apple II tape, \$10.95**

PSEUDODISK (Neuschatz) This money-saving program simulates a disk memory system for Integer BASIC programs. It allows multiple programs in memory at the same time which can be run from a catalog. **04804, Apple II tape, \$24.95**

6502 DISASSEMBLER (Stamm) Produce assembly language source files with labeled subroutines and references from programs already in memory. It is compatible with Hayden's ASSEMBLY LANGUAGE DEVELOPMENT SYSTEM. **08609, Apple II Disk, \$39.95**

DISK CERTIFIER AND COPIER (Jacc Inc.) A handy utility program that certifies the acceptability of blank diskettes and rejects those with flaws. It also includes a fast machine language disk copying program that will work on single and dual drive systems. **07809, Apple II Disk, \$19.95**

DISK CATALOGER (LeBar) Automatically maintains a cross-reference listing of all your programs, their location by disk number, their function and use. Catalogs, lists and sorts programs. **05203, TRS-80 Level II tape, \$16.95; 05208, TRS-80 Level II Disk, \$21.95**

BUSINESS

★★ HISTO-GRAPH (Boyd) A calendar-based histogram or bar-graph production system. Allows the user to enter numeric data that relates to a date, and reproduces that data as a high-resolution histogram. **09009, Apple II Disk, \$29.95**

FINPLAN: A Financial Planning Program for Small Businesses (Montgomery) Allows you to enter data from a balance sheet into the program, to make assumptions about the future growth of business, and to have the computer project results for up to a five year period based on those assumptions. And if you change any data, the program revises all resulting data automatically. The disk version can be used only with TRSDOS version 2.3. **05103, TRS-80 Level II tape, \$69.95; 05108, TRS-80 Level II Disk Version, \$74.95**

★★ Denotes New Program

DATA MANAGER: A Data Base Management System and Mailing List (Lutus) Store information on a floppy disk, and retrieve it quickly and easily by specific names, or by category. **04909, Apple II Disk Version, \$49.95.**

MAILING LIST (Tru-Data Software) Lists addresses, prints labels, allows for alterations and deletions, and has the capacity to make duplicate data file disks. Can only be used with version 1.5. **05713, Heath Disk \$49.95**

GAMES

SARGON II (Spracklen) The first great computer chess program! . . . an excellent program which will provide true challenge for many players. . . . Save your money and buy SARGON II. . . . '80 Software Critique. **#03403, TRS-80 Level II; #03404, Apple II; #03410, OSI C1P; #03418, TRS-80; #03440, OSI C4P; each tape \$29.95; #03408 TRS-80 Level II Disk; #03409, Apple II Disk; #03414, OSI C1P Disk; #03444, OSI C4P Disk; #03484, C8P Disk; each disk \$34.95**

BLACKJACK MASTER: A Simulator/Tutor/Game (Wazaney) A serious game that performs complex simulations and evaluations of playing and betting strategies. **05303, TRS-80 Level II tape, \$24.95; 05308, TRS-80 Disk Version, \$29.95**

MICROSAIL (Johnson) A true test of your nautical skills as you race against wind, tides, and time. **04401, PET tape, \$11.95**

GRIDIRON: A Microfootball Game (Microflair Associates) Be both offensive and defensive quarterbacks. Includes time-outs, penalties, and the two-point conversion option used in college football. **03003, TRS-80 Level II tape, \$12.95**

MAYDAY (Breitenbach) Out of fuel! Try to avoid crashing with this challenging airplane flight simulation. **02601, PET tape, \$9.95**

REVERSAL (Spracklen) Winner of the software division of the *First International Man-Machine OTHELLOTM Tournament*, this version of the 200-year old game Reversi, features 27 levels of play and high-resolution color graphics. **07004, APPLE II tape, \$29.95; 07009, APPLE II Disk, \$34.95**

STARCLASH (Walton) An exciting game of galactic strategy for one or two players. **05903, TRS-80 Level II tape, \$16.95**

ROYAL FLUSH: Competitive Poker Solitaire (Wazaney) A game you can play alone or with any number of players. High score wins in this poker-based, fun-filled card game. Choose from possible game variations. **07101, PET; 07103, TRS-80 Level II, each tape, \$14.95**

BACKGAMMON (Wazaney) A classic game of skill and luck played against a preprogrammed opponent. **02501, PET; 02503, TRS-80 Level II; each tape, \$10.95**

BATTER UP!!: A Microbaseball Game (Savon) Action-packed baseball with 3 levels of play. **02801, PET; 02803, TRS-80 Level II; each tape, \$10.95**

LANGUAGE

PROGRAMMING IN APPLETM INTEGER BASIC: Self-Teaching Software (Banks & Coan) Teach yourself Apple Integer BASIC and control your own progress at all times with this interactive programmed instruction format. **05004, Apple II, tape, \$29.95; 05009, Apple II Disk Version, \$39.95**

APPLETM ASSEMBLY LANGUAGE DEVELOPMENT SYSTEM: An Assembler/Editor/Formatter (Lutus) Write and modify your machine language programs quickly and easily. **04609, Apple II Disk Version, \$39.95**

SUPER APPLETM BASIC (Lutus) A structured BASIC that compiles into an optimized Applesoft or Integer BASIC program. **05409, Apple II Disk, \$39.95**

Super FORTH (Bugbee) This is a fast, high-level, expandable language that features integer and floating-point math, high-resolution graphics and string handling capability. **05509, APPLE II Disk, \$49.95**

ENGINEERING

★★ OP-AMP DESIGN (Gabrielson) Provides the necessary values for your design and will suggest appropriate op-amp types. Includes a choice of six op-amps, and the program will then determine if your selection of an op-amp will be acceptable within your chosen parameters. Can be updated to accommodate future op-amps. **09704, Apple II tape, \$16.95**

★★ DOUBLE PRECISION FLOATING POINT FOR APPLESOFTTM (S-C Software) Extends the accuracy of the arithmetic available on the Apple from nine digits to a full 21-digit precision on all functions in Applesoft compatible format. **09409, Apple II Disk, \$49.95**

MCAP: A Microcomputer Circuit Analysis Program (Savon) Performs a linear voltage, impedance, or transfer impedance analysis of an electronic circuit. **04501, PET; 04503, TRS-80 Level II; 04504, Apple II; each tape \$24.95; 04513, Heathkit/Zenith Disk, \$29.95**

ENGINEERING MATHEMATICS-1 (Gilder) Contains eight programs useful to the engineer: 1. Solving Simultaneous Equations 2. Evaluation of a Polynomial 3. Quadratic Equations 4. Integration by Simpson's Rule 5. Newton-Raphson Roots 6. Derivative of a Function 7. Factorial of a Given Number 8. Extended Factorial Calculation. **01301, PET; 01303, TRS-80 Level II; 01304, Apple II; each tape \$14.95**

MICROCOMPUTER AIDED DESIGN OF ACTIVE FILTERS (Gilder) Eight programs that simplify the design of active filters and will calculate the component values needed for various bandpass, low-pass, and notch-type filters. **01401, PET; 01403, TRS-80 Level II; 01404, Apple II; 01407, Heath; each tape \$16.95; 01413, Heathkit/Zenith Disk Version, \$21.95**

EDUCATION

CROSSBOW (Breitenbach) Features a target game that, besides offering hours of fun, teaches fractions in an exciting and competitive environment. An educational program for all ages. **02701, PET tape, \$9.95**

GENERAL MATHEMATICS-1 (Gilder) Contains 15 programs useful to anyone who wants to improve their math skills and accelerate their computation. The fifteen programs are: 1. Log to Any Base 2. New Coordinates 3. Rectangular/Polar Coordinates 4. Permutations 5. Combinations 6. Vector Cross-Products 7. Vector Scalar Products 8. Max/Min Locator 9. Number Rounder 10. Dimension Scaler 11. Histogram 12. Circle Finder 13. Nth Root of a Number 14. Normally Distributed Random Numbers 15. Rational Fractions. **01101, PET; 01103, TRS-80 Level II; 01104, Apple II; 01105, Sorcerer; each tape \$14.95**

COMPLEX MATHEMATICS (Gilder) Contains 8 programs that give the user the ability to perform computations of complex numbers in BASIC rather than in FORTRAN. The eight programs are: 1. Absolute Value 2. Complex Subtraction 4. Complex Multiplication 5. Complex Division 6. Nth Roots of a Complex Number 7. Complex Exponential 8. Complex Number to a Real Power. **01201, PET; 01203, TRS-80 Level II; 01204, Apple II; each tape \$14.95**

AT HOME

ENERGY MISER (SuperSoft Associates) A complete heating/cooling analysis program for your home or office that will calculate heat loss or gain due to poor insulation, leaky doors and windows, and more. **05601 PET; 05603, TRS-80 Level II; each tape \$29.95; 05609, Apple II Disk Version; 05613, Heathkit/Zenith Disk Version; \$29.95**

PERSONAL PROPERTY INVENTORY (Southern Systems) Here's an easy-to-use program that lets you develop, maintain, sort and save an inventory of your personal property. **08903, TRS-80 Level II tape, \$14.95**

GENERAL INTEREST

★★ DATA-GRAF (Boyd) Aids in the preparation of graphs and charts. Numeric data can be entered into Data-Graph and used to create colorful one-, two-, or four-quadrant graphs. **09109, Apple II Disk, \$49.95**

SONGS IN THE KEY OF APPLE (Lopatin) Allows you to see and hear your favorite tunes, pre-programmed tunes or music you create (up to 200 notes, including rests, per musical piece). **03304, Apple II tape, \$10.95**

SKETCHMODE (Walton) Create computer graphics, modify them, save them, and read them from tape. **03203, TRS-80 Level II tape, \$11.95**

KEYNOTE (Microflair Associates) Hear any type of music in slow, medium, or fast tempo. **02903, TRS-80 Level II tape, \$9.95**

BIOCURVE (Microflair Associates) Charts your rhythms against another person's and suggests when you will be in a state of instability and therefore vulnerability. **03103, TRS-80 Level II tape, \$9.95**

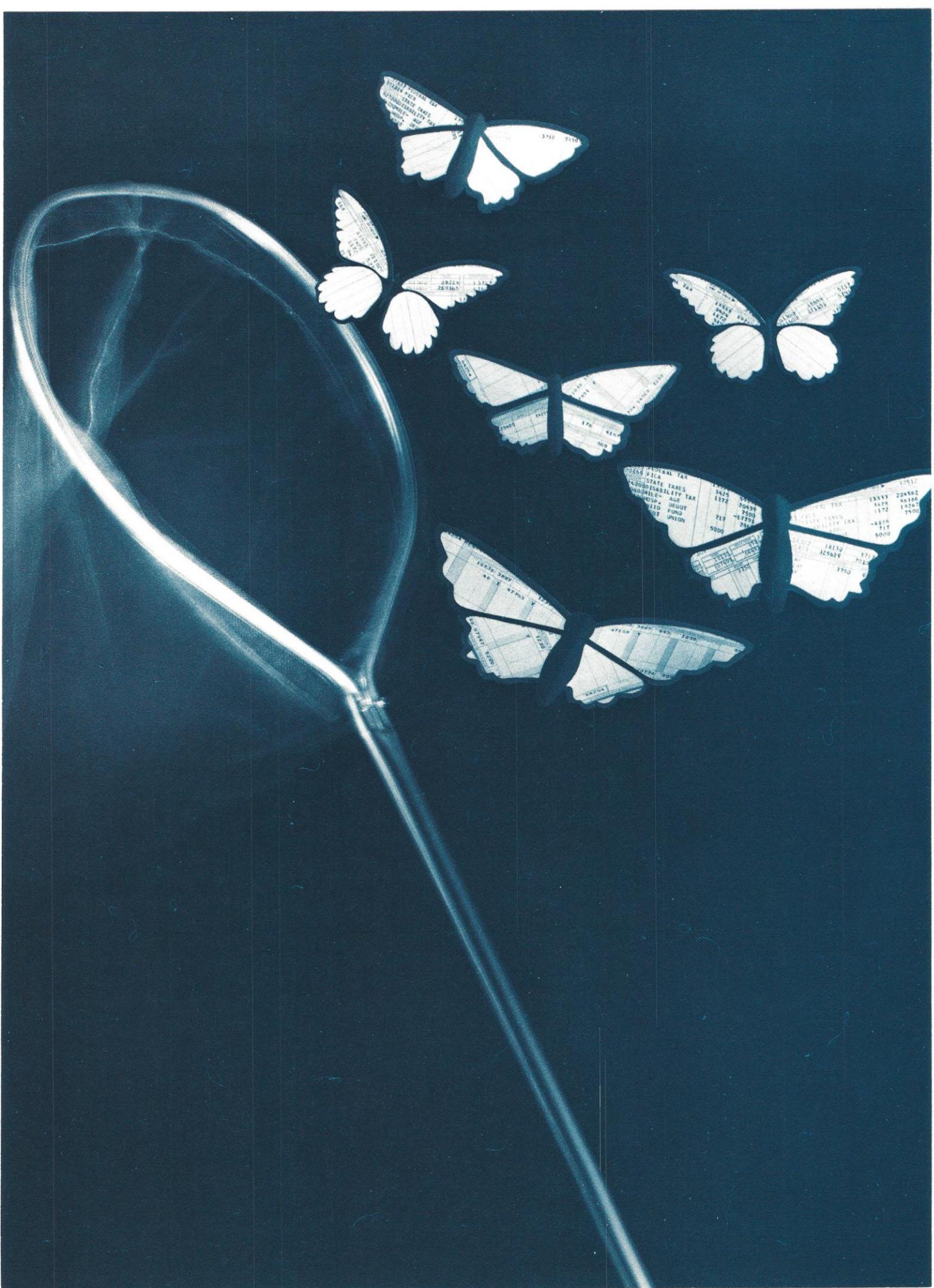
HOW TO BUILD A COMPUTER-CONTROLLED ROBOT (Loofbourrow) Contains 5 control programs that consist of Joystick Control Program; Self-Direction Program; Impact Sensor Control Routine; and more. **00100, KIM-1 tape, \$14.95**

MICROTYPING (Engel) Features the "touch method" of learning to type for improving your computer skills. **02401, PET; 02403, TRS-80 Level II; 02404, Apple II; each tape \$10.95**

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BUSINESS COMPUTING

In Pursuit Of The Perfect Payroll Program

A look at 15 packages that small businesses can run on a personal computer

Small businesses have been caught for years in a payroll trap. They have had to rely on monotonous, time-consuming and error prone manual systems. They've paid a legion of clerks, bookkeepers and accountants to keep records, tally the pay rates, calculate the half dozen tax deductions and an increasing number of personal deductions, write the checks, audit the check register and distribute the checks to employees.

Larger companies meanwhile have farmed their payrolls out to computer service bureaus or bank data-processing departments. Yet even these companies have encountered problems. They've found their processing costs soaring, so that even a business with 20 employees could expect to pay \$100 a month for outside data-processing services.

Since the advent of the microcomputer revolution six years ago, small and medium-size businesses have searched and waited for a well-written payroll program that they could handle themselves. However, until the past year their search was in vain. A payroll program is just about the most difficult type of business software to write. It can require more than 50 different entries and at least a dozen calculations, and it may produce 10 or more reports. All of the data must be

crammed into a relatively small random-access memory of 32 to 64K. And it should accommodate, on one disk, up to 100 employees.

Programs like this are available today. Now, instead of the \$100 a month that some businesses were paying a service bureau or bank simply for payroll processing, they can computerize an entire accounting department and own the computer as well. There are at least 15 packages that can do this.

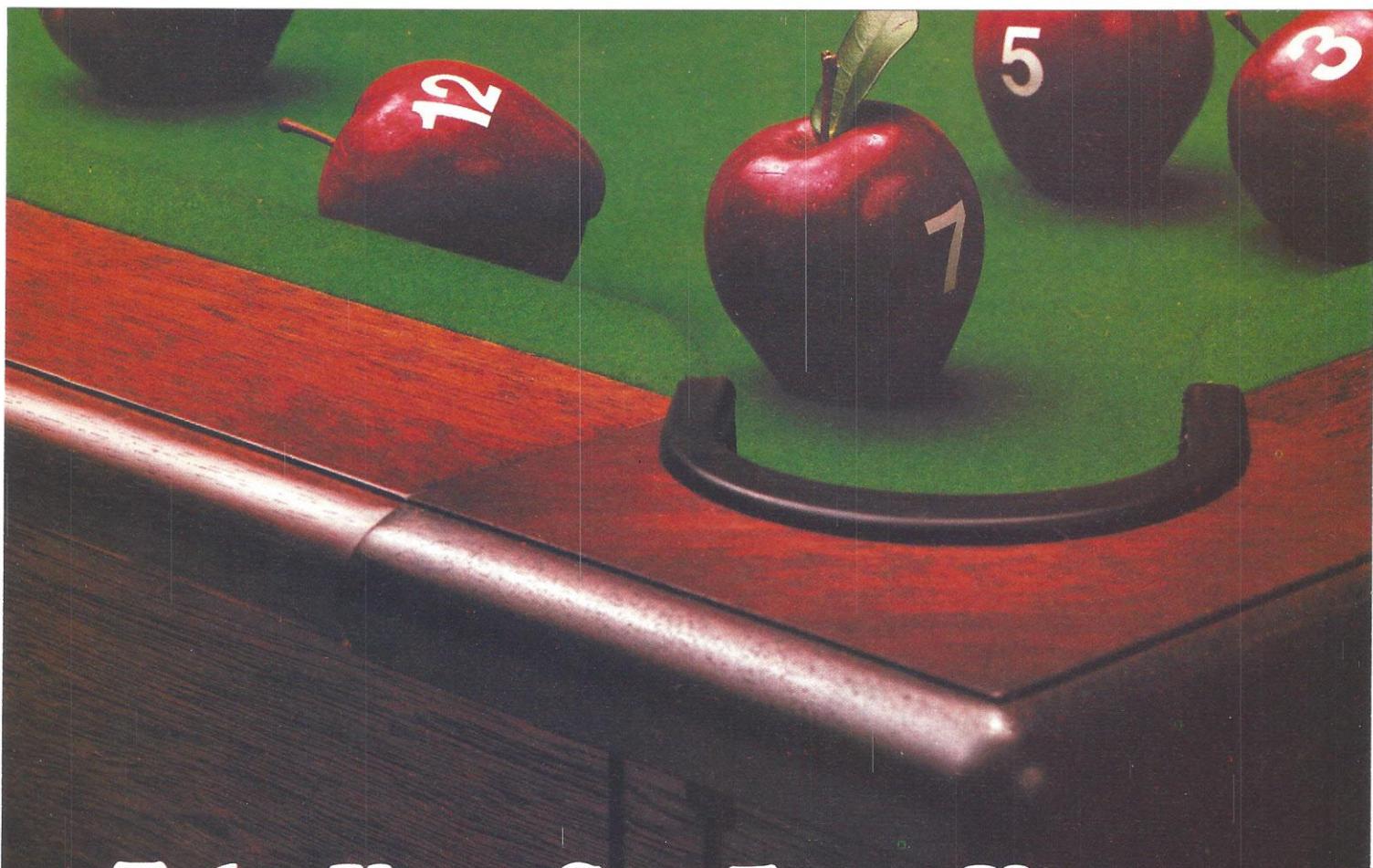
Small to large capacity

The capacity of these packages ranges from a system holding a maximum of 10 employee files on a mini-floppy disk to a system that can hold more than 200 employee files on a double-density, eight-inch floppy disk. Theoretically, as long as a user is willing to process disks, each package has unlimited capacity. But, practically, few payroll departments would want to process several full disks every pay period because of the time required.

Any payroll program should perform these basic tasks:

- Establish a master employee file, with all pertinent personal and wage and salary information.
- Allow easy and fast preparation of the payroll for a desired period of time.
- Calculate gross earnings, deduc-

continued on page 17



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When it comes to Apples, take your cue from Vista's A800 Eight-Inch Floppy Disk Controller. The A800 offers a cost-efficient approach to software compatible disk memory expansion for your Apple II® computer. The A800 Controller enables Apple II users to access up to five megabytes of online storage through conventional disk operating (DOS) commands.

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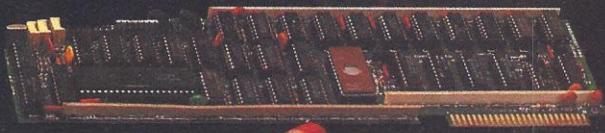
It's a Sure Shot.

Apple II computer. It also interfaces to all Shugart/ANSI Standard Eight-Inch Floppy Disk Drives. The A800 provides complete IBM format compatibility in both single and double-density modes.

THE HOT SHOT AT A COOL PRICE. The A800 is reasonably priced at \$595. A price you can't beat when you compare its quality and performance.

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Vista offers you a complete line of peripheral equipment to maximize the capabilities of your Apple system including: High capacity Mini-floppy Disk Drives, the Vista Music Machine 9 and the Vista Model 150 Type Ahead Buffer. In addition, Vista offers a line of advanced components fully compatible with the TRS-80* and S-100 based computers.



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tions and net earnings.

- Print checks and, if desired, itemize check stubs.
- Process and print required government reports, such as the Form 941A quarterly tax report and annual W-2 report.
- Prepare a number of registers, journals and reports that a company needs to meet good accounting principles, such as check registers, employee earnings records and payroll registers.
- Produce accurate audit trails that a company's outside accountant can easily follow.

If a payroll program cannot carry out each of these functions, it will not have the power, flexibility and versatility most small businesses require.

Speed is important

Another important factor is speed. How fast will the computer calculate and process the entire payroll file when all of the data entries have been completed? For example, BPI Systems estimates that its package will calculate and process one employee's file in one and a half to two minutes. If your company has 100 employees, that's between two and a half and three and a half hours to complete the payroll after the staff has completed the data entries. And BPI is one of the quickest programs; others take at least several hours for 100 employees. With any of these programs, your computer can expect to get a heavy workout when the payroll is prepared.

Equally important, a payroll program must be secure. For most employees and business managers, payroll information is the most confidential financial information a company possesses. Yet there must be easy-to-follow audit trails, so a business owner or his accountant can be sure payroll checks reach the proper employees. Without prelist-

ings and audits after the checks are written, any payroll system, manual or computerized, is open to theft.

While most of the programs on the market fulfill the requirements for prelistings and post audit security, they do not solve a second crucial security problem: access. None of these 15 programs includes more than one level or password security. In many cases any employee who knew how to operate the microcomputer and got a copy of the payroll data could easily manipulate the data and cut checks to his own and fictitious names. In a larger company, in which accounting department employees do not personally know or recognize each individual, a fictitious employee could "fall between the cracks" allowing a thief to steal thousands of dollars.

It is not enough to simply tell a buyer to keep his disks in a safe place. What constitutes a "safe place" in your company? A safe? A locked cabinet? The business owner's home?

Encryption recommended

It is strongly recommended that any purchaser of these payroll programs hire a programmer to encrypt the software—that is, write in nearly unbreakable passwords—or at least ask the dealer how to add existing encryption software to these packages.

Most of the manuals that accompany the payroll programs advise making back-up copies of every disk after each payroll is prepared, but none explains in sufficient detail how these disks should be protected from prying eyes and improper use. It is not enough simply to tell a buyer to keep them in a safe place. What constitutes a "safe place" in your company? A safe? A locked cabi-

net? The business owner's home? Safe places and adequate precautions are not explained.

Three types of payroll software

Payroll programs can be divided into three basic types: menu-driven, program modules and Osborne/McGraw-Hill format. Eleven of the 15 programs listed here are menu-driven. All are transparent to the user and operate through simple tree structures; a user chooses a desired function, such as "calculate payroll," and the software branches directly into the operation.

In a program module such as Graham-Dorian's, a user must become familiar with the operations of CP/M and CBASIC, as well as specific program listings and operating procedures. The Graham-Dorian package is oriented to a disk file and has 12 program modules. Nine of the 12 operate together through CBASIC's CHAIN and COMMON commands. This modular approach appears more complicated than most simple menu structures and can discourage untrained novices.

The Osborne/McGraw-Hill accounting package is based on one huge menu with a total of 34 programs, each of which can be accessed directly through the main menu. This is exceptional because it does not combine a number of similar or related functions into groups. In the menu-driven software, few menus have more than five or six choices. A user completes a cycle of data entries or calculations before continuing to the next menu. In the Osborne program, a user carries out each task and then recycles to the main menu.

This has both advantages and disadvantages. The main advantage is that one has access to any operation at practically any time. But a major disadvantage is that this might confuse untrained payroll clerks,

TABLE 1:
FEATURES OF 15 PAYROLL PROGRAMS

See Table 3 to match names of companies with the letters.

FEATURE/COMPANY	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
Check-writing	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Hourly wages	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Salaries	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Fed. tax withholding	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
FICA tax	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
State tax	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Local/city tax	●				●				●	●	●	●	●	●	●
W-2 forms print	●		●	●	●	●	●	●	●	●	●	●	●	●	●
Form 941A print	●			●	●	●	●	●	●	●	●	●	●	●	●
Total deductions	9	9	5	16	8	12	8	6	9	8	5	5	8	5	5
Commissions	●				●			●	●	●			●		
Tips	●				●								●		
Nontaxable income	●				●			●	●	●					
Disability ins. deductions	●	●	●	●		●			●	●	●	●	●	●	●
Insurance deductions	●	●						●		●	●	●	●	●	●
Standard pay periods	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Optional pay periods	●							●	●				●		
Job costing	●	●	●			●		●			●				
General-ledger interface	●	●	●		●		●		●	●	●	●	●	●	●
Workmen's comp.								●		●		●			
Time-card labels					●				●						
Handwritten check entry					●				●			●		●	●
Prevent excess withholding	●														
Customizing	●	●	●	●											

thereby lengthening the time needed to learn the operation. Another is that each function cannot be made secure from user interference.

Some menu-driven programs, on the other hand, do not allow a user to access end-of-period payroll functions until all regular processing is completed. But this can prevent accident or deliberate destruction of the payroll records.

Saving time in four ways

The most important factor in any payroll software is how it saves time.

It does this in four ways.

First, each of the three types of payroll programs will calculate automatically the amount of an employee's earnings from data stored in memory. For example, if Joe Smith's salary is \$400 a week, the software will figure the tax, insurance and miscellaneous deductions and the net salary each week without the clerk's input. A user need work with Smith's file only if changes occur—if he gets a raise, for example, or if taxes go up or he goes on vacation.

Second, the payroll staff is freed from manipulating figures and data from sheet to sheet. Third, the computer will cut each check without a lot of effort by the user. Fourth, software can automatically produce end-of-period, monthly, quarterly and annual summaries, along with a slew of other reports.

Thus, one or two payroll clerks can do the work that used to require two or three times that many. In addition, micro-based software produces payroll checks when you want them, and changes can be made very

TABLE 2:

PRINTED REPORTS AVAILABLE ON 15 PAYROLL PROGRAMS

REPORT/COMPANY	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
Employee master list	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Check register	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Payroll register	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Employee's earnings record	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Period posting															
Monthly:	●			●											
Quarterly:	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Yearly:	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Payroll summary	●			●	●		●	●		●				●	
Payroll general-ledger listing	●	●	●			●	●			●			●		
Deductions				●		●		●			●	●	●	●	●
Consolidated tax report	●			●						●			●		
Post excess tax report	●														
Payroll trial balance	●														

TABLE 3:

COMPANY NAMES AND EMPLOYEE CAPACITY PER DISK

Match the letters in the tables above with the companies in this table to coordinate each company's features and reports.

LETTER	COMPANY	CAPACITY/Disk
A	BPI Systems, Inc.	100
B	Charles Mann & Assoc.	10
C	Compumax	50-200
D	Computer Products Intl.	100
E	Graham-Dorian	100
F	International Micro Syst.	400
G	Lear Data Tri-Star	700
H	Ohio Scientific	200
I	Radio Shack	200
J	Retail Sciences	150
K	Serendipity	50-250
L	Small Business Systems	10-250
M	Structured Systems Group	50-300
N	Taranto	10-250
O	Vandata	10-250

easily by your own staff. Of course, when investment tax credits, depreciation and multiple uses of the same hardware are included in the figures, payroll software can save a company a lot of money.

Set-up procedure needed

However, small-business owners should not expect to buy a computer and payroll software today and to produce errorless printouts tomorrow. Even the easiest payroll software involves a detailed, time-con-

continued on page 21

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- Error-tolerant and trouble-free
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- Operable without printer or second disk unit
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suming set-up and data-entry procedure. Remember, someone has to put the existing payroll information into the system *after* learning how to use the computer. This means transferring thousands of items of information from manual or service bureau records onto floppy disks through the keyboard. No one has yet decided to write software that transmits payroll data from a service bureau's computer to a micro.

This set-up and file construction process can take from a day for a small company with a dozen employees to a week or more for one with hundreds of employees. Most businesses may find it most convenient to begin running the new computerized system either at the first of the fiscal year or the beginning of the calendar quarter.

Setting up the computer system is the first of the seven steps common to all computerized payroll systems. The others are:

- Construction of an employee master list and basic file maintenance.
- Entry of basic payroll data and entering payroll transactions.
- Executing the payroll—that is, calculating the actual payroll figures from the stored data about each employee.
- Printing checks, check stubs and reports.
- Interfacing or transferring payroll data to the general ledger (only in integrated systems.)
- Processing and closing files at the end of each period: month, quarter or year.

Along with these common procedures, each program offers automatic check writing, in which every employee's check is printed with all of the pertinent information on the check and check stub, including gross pay, deductions (listed separately), net pay, and the employee's name (and usually address), and other required data.

DEDUCTION CATEGORIES

Tax deductions. Each program can compute at least three types of taxes and deduct them from an employee's wages. These are Federal income withholding, Social Security (FICA) and state taxes. Previously a serious shortcoming among payroll programs was their inability to deduct state or local (city and county) income taxes. Writing software to handle 50 states and many cities and counties is difficult. But today each of these programs can calculate state taxes, and 10 of the 15 calculate local taxes.

However, they use two methods to calculate state and local taxes. A few, such as the BPI System package, include the state and local tax tables in the software itself. These houses issue annual updates—for a few, usually \$50 a year—incorporating any changes that a state or locality has made. But the majority of payroll packages require the user to add the state and local tax tables to the software. Some, notably Radio Shack, give you the income tax withholding schedules of all 50 states, while others will either give you the schedules you need or sell them to you.

Needless to say, entering state and local tax tables into a package is tedious and mistakes can easily occur. Users should make several trial runs after entering each table to be sure the information is correct.

Unemployment taxes. About half of the packages allow for Federal and state unemployment tax deductions. Many states do not require payment of state unemployment taxes, in which case, only Federal taxes apply. Most of these that do require the user to incorporate the applicable schedules and formulas into the software before deductions will work.

Disability insurance. Ten of the 15 packages provide specific categories

for disability insurance deductions. Such deductions can be state taxes or private insurance premium payments. The package can include both.

Workmen's compensation. Although most states require unemployment compensation payments, only a few of the packages include a specific deduction for it. With the others, the user has to define an unused deduction for unemployment taxes and insert the state's formula or percentage deduction.

Insurance deductions. In addition to disability deductions, half of the packages set up specific deductions for medical and health insurance premiums. In some cases, the package sets the time of the month these deductions will be made; in others the user can select the time of the month—either once a month or during each pay period, for instance.

Miscellaneous deductions. Every package includes at least one user-definable deduction. The total of available deductions ranges from five (four tax deductions and one optional) to 16. Compumax and Serendipity have five, while Computer Products International has 16 and International Micro Systems 12. BPI, Charles Mann and Radio Shack have a total of nine—four tax deductions and five other—and this appears to be an optimum number. Five seems to be too few for any company that has union dues deductions, insurance premiums, credit union deductions or any other deduction. Two packages set aside specific categories for union codes.

EARNINGS CATEGORIES

When it comes to earnings and how they are handled, there is a great disparity in payroll programs. It is important that the software include wages that should not be taxed, such

continued on page 53

Western Digital To Develop System Based On MIT Technology

The Massachusetts Institute of Technology and Western Digital Corporation have announced the signing of an agreement licensing Western Digital to develop and manufacture an advanced system of networked personal computers derived from MIT technology. The first machine will be used at MIT.

The new system will be designed for dedicated use in a network environment for the professional, scientific and business markets and will be based on technology under development at MIT over the past four years. Central to the concept, says Western Digital, is a unique hierarchical bus architecture which permits flexible configurations and expandability. The system will initially be used in the Laboratory for Computer Science and elsewhere on the MIT campus for instructional and research uses.

Used-Computer Service Begins

In an attempt to overcome the problems found in buying and selling used micro computer equipment, a nationwide used computer information service has begun.

The Used Computer Exchange, located in Reston, Virginia, puts together buyers and sellers of used computer equipment. Acting as an information clearinghouse, the exchange focuses on systems with a market value under \$10,000. For \$7.50, the buyer of used computer equipment receives a listing of people with equipment to sell that meets the buyer's criteria. The seller of the equipment pays the Exchange 5 percent of the final purchase price. The commission is only payable if a sale is made.

Televideo Moves into Dumb Terminal Market

Televideo has introduced a new low-cost cathode-ray tube (CRT) terminal priced at \$699.00. Model 910 features include switch-selectable compatibility for emulating the Lear Siegler ADM3 or ADM5, Hazeltine 1410 and ADDS 25 or Viewpoint. This enables the Model 910 to be used without modification in existing systems using many of the most popular CRT terminals. The user can change the Model 910's character font from English to Spanish, German or French.

Available this month, the Model 910 is supported nationwide by General Electric Company's Instrumentation and Communication Service Centers.

Stanford To Offer New Degree

Starting this fall, the Stanford School of Education will offer a new Master of Arts degree program in interactive educational technology, combining courses in computer science, educational psychology and curriculum theory and design. The focus of the program is to prepare graduates in applying educational principles and educational technology to improve educational resources of schools, homes, and industries, according to Professors Robert Hess and Decker Walker.

"Although computer-assisted instruction has been around for almost two decades, widespread application of computer technology to education has hardly begun," stated Walker and Hess.

continued on page 24

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CIRCLE 16

NEWS

Price Barriers Crumble On Color Printers

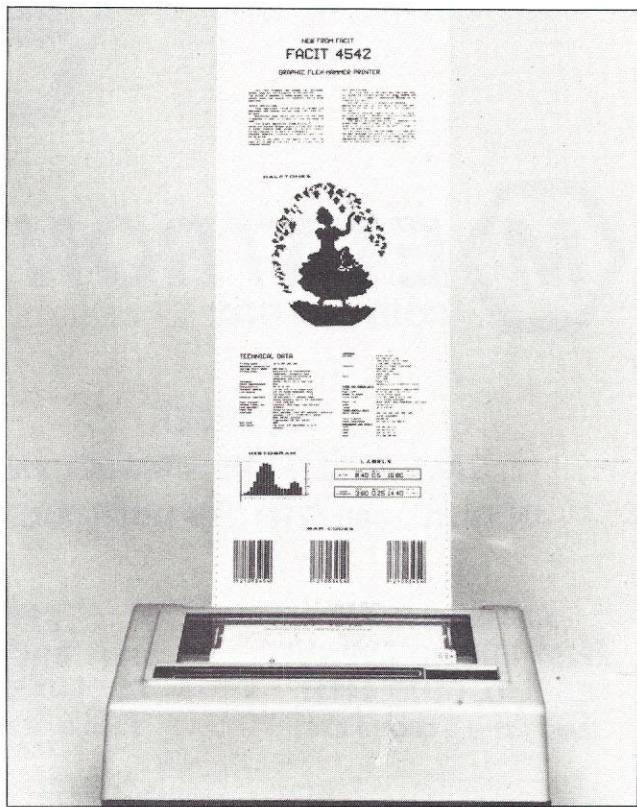
The use of color-graphics on personal computers in the business office has been stymied for several years by the lack of an inexpensive four-color hard-copy device. That barrier may now start to crumble, as four manufacturers have bowed printers that provide color output at prices under \$5000.

Before this year's NCC, at which the low-cost color printers were unveiled, devices that provided hard-copy color output started at prices of about \$10,000. These are matrix printers from IBM, Ramtek and Trilog. The only other method of producing four-color output is the use of color cameras that take pictures of the screen. Again, these are expensive.

Now, though, Facit, Integral Data Systems, Integrex, and Okidata are breaking the price line.

High readability

The Facit 4542 is a dot-matrix printer using Facit's Flexhammer printhead design which incorporates a set



Besides printing curves and diagrams the Facit 4542 can also print a picture with halftones in either scanning mode or a semigraphic character generator.

of nine metal hammers mounted directly on a magnet armature. Available now with two colors (red/black) it prints at 250 characters-per-second (cps) with standard spacing and up to 535 cps with proportional spacing.

The 4542's business capabilities include printouts of inventory files, stock lists, sales statistics, market reports, invoices or any other combination of alphanumerical information. In a graphics mode the 4542 prints curves, bar codes, diagrams and pictures with halftones.

Up to 512 characters can be printed in four colors, elongated or underlined for further readability. In the variable size option, characters can be printed in 95 different sizes from 2.52mm (approximately .1 inch) to 240mm (approximately 9.4 inches).

The 4542 can construct flowcharts and graphical images with a semi-graphic character set or, for higher resolution and differentiation between fields of interest, in grey-scale mode with 10 different levels of grey/red. There is also a scanning mode in which the 4542's Flex-hammers can be individually activated via an interface to print any type of curve, diagram, logo, map, drawing or picture.

The printer costs \$4500, with a four-color model to be in production within 10 months at the same price.

New member of the family

The Color Printer is the latest member of Integral Data Systems' Paper Tiger line. It prints in four basic colors: black, cyan, magenta and yellow. It can also mix colors to make four more: orange, violet, green and brown.

Printing capabilities include correspondence-quality print in a 24 x 9 matrix cell, six software-selectable character sizes, programmable horizontal and vertical tabbing, six or eight lines-per-inch spacing and adjustable tractor feed.

The graphics and color capabilities of this printer make it a candidate for the business-graphics area. According to Mel Bosch of IDS, "One of the fastest growing markets is that of business graphics, so we certainly see that market as a major potential for the Color Printer." It can produce bar graphs and other graphics with 84 x 84 horizontal and vertical dots-per-inch resolution.

According to IDS, the printer was very well received at the National Computer Conference in May and will be available in the fall at a retail price of under \$3000.

Seven color capability

The CX80 Color Matrix Printer from Integrex is a serial impact dot-matrix unit with a control command which calls up each of seven colors as required. The CS80 ribbon has three length-wise stripes (yellow,

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By Bruce Wallace

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By Don Worth and Pieter Lechner

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WORD SEARCH Computer generates word search puzzles using either a Spanish, French or geography word list. Atari version uses color, sound and other special effects, and will even generate printed puzzles for you to do when away from the computer. This is an excellent way for students to practice foreign language vocabulary.

ASTRO-QUOTES This is an anagram-type game. The goal of the game is to guess a famous quotation. Clues are letters that the computer inserts in the correct slots in the quotation when the player correctly guesses the definitions of a series of words.

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CIRCLE 18

NEWS



Okidata's Model 2350, a high speed serial matrix printer, uses a nine pin head and prints in red and black.

magenta and cyan) with the seven colors obtained in combinations of the three stripes.

Integrex has built in 96 ASCII and 64 graphics characters. The user can also program, via the built-in interface, up to 15 additional characters. Any dot or combination of dots may be printed in any of the seven available colors and dots, characters and color can be mixed along a line.

The formats are 5x7 for the ASCII characters and 6x7 for the graphics and user-programmable characters. All characters may be printed double-wide, reversed, or stepped horizontally in a 1/60 inch increments for word-processing applications. The print speed is 125 characters-per-second, 55 lines-per-minute maximum.

Applications for this printer include business graphics, histograms, pie charts, graph plots, statistical analysis, computer-aided design, financial analysis, cartography, animation, advertising layout and language teaching.

The CX80, already available in England, is schedule

TRS-80 Goes To Japan

Tandy Corporation and Tokyo Electric Company (TEC) have reached a joint agreement whereby TEC will sell Tandy's computer products in Japan. Tandy Corp. has been selling its products in Japan through its Tandy Radio Shack sales organization. It has been agreed that TEC will par-

ticipate in the sales of microcomputer products.

TEC, one of the Toshiba group of companies, is the leading manufacturer of electronic cash registers and point of sale terminals in Japan.

In accordance with this new agreement, TEC will sell the whole TRS-80

to be released in the United States this summer at a retail price of under \$2000.

High speed

Okidata's Model 2350 is a high speed, 350-cps serial matrix printer. The unit prints 500 lines-per-minute at 20 characters-per-line, 340 lines-per-minute at 40 characters-per-line, 210 lines-per-minute at 80 characters-per-line and 150 lines-per-minute at 120 characters-per-line.

Standard features of this unit include two-color printing, superscripts and subscripts, and six programmable character pitches. Options of the printer include 72 x 72 dot-per-inch graphics, fixed or loadable alternate character sets, and pull tractors for special forms handling. The unit also boasts horizontal and vertical tabs, 10 form lengths and external paper feed commands.

According to Lex Pietraszkiewicz of Okidata, the machine will be used basically for the enhancing of the graphics mode. The retail price of the Model 2350 will be approximately \$1500.

Vendor Guide

Facit Data Products, 66 Field Point Rd., Greenwich, CT 06830; (203) 622-9150.

Circle No. 161

Integral Data Systems, Inc., Milford, NH 03055; (603) 673-9100.

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Integrex, Inc., 233 North Juniper St., Philadelphia, PA 19107; (215) 627-0966.

Circle No. 163

Okidata Corporation, 111 Gaither Dr., Mt. Laurel, NJ 08054; (609) 235-2600.

Circle No. 164

computer series including Model I, II and III. It planned to open a computer center in Tokyo in April to begin establishing a sales and service organization including an education program for users, the company said. TEC also plans computer centers in Osaka and Nagoya and has firm plans to expand the sales and service ac-

tivity in cooperation with Tandy Radio Shack.

In addition, a part of this agreement TEC will manufacture the TRS-80 Model I for the market in Japan. Tandy's decision to permit TEC to manufacture the Model I was based on its previous relationship as a manufacturer for some other Tandy products.

continued on page 28

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CIRCLE 19

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NEWS

Atari Software Acquisition Program

A new effort to expand the library of consumer oriented software for its personal computer systems has been launched by Atari, Inc. The company is looking for high quality programs that can be used immediately, and easily, by people with little or no training in the use of computers.

Atari is interested in acquiring software in the areas of personal finance, self-improvement, education and home entertainment, the company said. They are encouraging the creation and marketing of software by vendors and developers, and want to help market appropriate materials from outside authors. "To start things off, we are sponsoring a \$100,000 contest for software authors," said Bruce W. Irving, vice president.

The acquisition program involves the creation of Atari Software Acquisition Program regional centers, where qualified developers can work with Atari equipment and receive technical assistance, and Atari Program Exchange, a free quarterly catalog of user-written software to be distributed to Atari computer owners. In addition, Atari will offer periodic technical seminars for

qualified software authors to familiarize them with the inner workings of Atari computer products and enable them to write programs that take advantage of all the advanced features of the Atari 400™ and 800™ computers.

Beginning with an initial installation in the Sunnyvale area, Atari will develop software acquisition centers in geographical areas where there are high concentrations of programmers and users, such as metropolitan areas with technical universities. No timetable has been announced for the opening of these additional facilities.

Qualified developers will be able to use the centers on an appointment only basis. Design of the centers will help insure the privacy of material under development. Each center will be equipped with Atari computers and peripherals, all necessary reference materials and technical manuals. Center staff will help answer technical questions and review and evaluate completed software.

Once a program is completed, Atari may be interested in marketing it under the company name, or accept it for listing in the Atari Pro-

gram Exchange catalog. Or, developers may wish to market the program on their own.

The company will issue a quarterly catalog of these contributed programs to registered Atari computer owners, contributors to the catalog and those who purchase programs from the catalog. Prices in the initial catalog range from about \$10 to \$50. Atari will not support the programs, but will supply user-written documentation and evaluations of each program. Program authors will be paid quarterly for submissions, based on actual sales. Users' group software collections will be listed separately in the catalog.

Authors who have had software published in the catalog will be eligible for prizes totaling \$75,000 worth of Atari products and a \$25,000 cash grand prize. There will be a contest every three months, and three prizes will be awarded for best programs in each of four categories—consumer (games, personal development, home and hobby), business, education and systems software. The grand prize will be awarded for the best program submitted during the contest year. Software submission information, catalog and contest details are available from Atari, Inc., 1265 Borregas Ave., P.O. Box 427, Sunnyvale, CA 94086.

Peachtree Software Acquires Word Processing Package

Retail Sciences Inc. announced that they have acquired the assets of Small Business Applications Inc. of Houston, TX, whose principal product is Magic Wand™, a word processing software package.

Magic Wand will be offered worldwide with RSI's other Peachtree Software packages through its network of more than 325 dealers, the company said. The package offers a comprehensive range of full-screen text editing, docu-

ment creation and merging, and text formatting features that are compatible with any microcomputer based on the 8080 microprocessor. More than 3,000 Magic Wand packages have been sold through SBA's dealers since its introduction in 1980.

RSI plans to work closely with SBA's present Magic Wand dealers to make consistent and eventually merge the two companies' distribution plans.

continued on page 30



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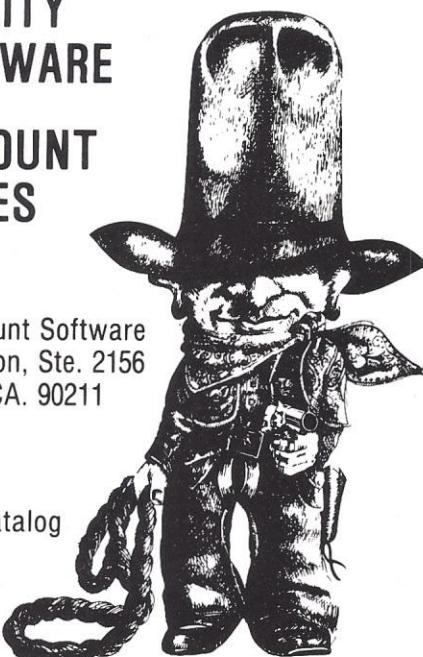
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CIRCLE 23

NEWS

Centronics Receives FCC Certification

Centronics Data Computer Corp. of Hudson, New Hampshire has received Class B certification from the Federal Communications Commission for its Models 730 and 737 dot-matrix printers, which are marketed in the U.S. to home, hobby and small business users.

Certification assures compliance with the Federal Communications Commission's regulations, which are intended to prevent radio frequency emission by computing devices (defined by the FCC as computers, computer peripherals and other equipment) and interference with television and radio reception.

Retail consumers should be aware that computing devices manufactured after January 1, 1981 and intended for use in residential areas either must be labeled as FCC Class B certificated or must be labeled as marketed under a temporary waiver of FCC rules, with a label which states in part: "Operation of this (device) in residential areas may cause objectional interference to radio and TV reception, because it emits more radio frequency energy than the FCC rules allow. If interference occurs, the user will be required to take all steps necessary to correct the interference."

Support and Consulting Offered For Hewlett-Packard

A new software support service, including phone-in consulting, and three new on-site consulting services are available for Hewlett-Packard desktop computer and personal computer owners. The software support and consulting services are designed to help owners get the maximum performance out of

HP Series 9800 desktop and Series 80 computers.

System Information Service provides the HP computer owner with phone-in consulting service, manual change sheets, and a quarterly magazine called the Communicator. HP guarantees that when a customer phones with a software problem, an ex-

perienced systems engineer will respond within four hours. The manual change sheets will assure customers of up-to-date documentation, and the Communicator will provide detailed technical information, application data, operational tips, and programming tips.

System Information Service, which is purchased according to system type, supports all firmware, specific terminal emulators, and selected software such as HP 9845 QUERY and HP Series 80 Data Communications Pac. The

contractual agreement costs between \$25 and \$95 per month depending on the system, and customers who purchase 12 months of support initially will receive three months of free support.

Three new on-site consulting programs are available to help HP desktop and personal computer owners improve the performance of their HP products.

"Interfacing" consulting is designed to help owners establish and optimize communications among HP desktop, personal, or modular computers and interface in-

struments. The service includes interface hardware configuration and verification, software configuration, and program optimization assistance.

"Remote Job Entry (RJE) Bisynchronous Data Communication" consulting is available for HP Series 9800 Systems 35 and 45 desktop computers and offers design recommendations, terminal emulator operation assistance, start-up condition modification, and review of data comm activities.

"Data Base Management" consulting, which

is available only for the HP 9800 System 45, covers overall program design, user extensions to QUERY/45, exchanging data bases with other HP mainframes, and troubleshooting software problems.

These consulting services are offered at \$800 for the first day, and \$600 for subsequent days. They are available worldwide subject to HP systems engineer availability.

For more information contact Inquiries Manager, Hewlett Packard Co., 1507 Page Mill Rd., Palo Alto, CA 94304. 

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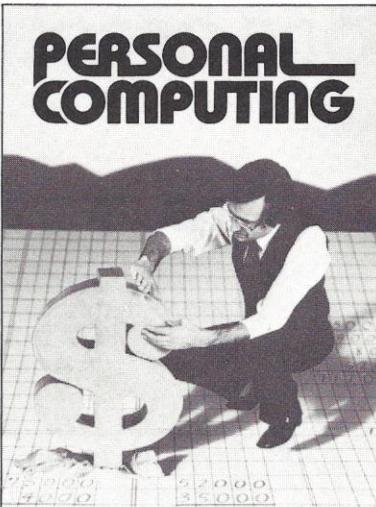
He may even have bought PERSONAL COMPUTING first and used it to decide whether and which for the rest of his purchases.

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advantage of what they know. PERSONAL COMPUTING is supplying them with answers and solutions through articles like these:

- How to use their machines to look at the future impact of their present decisions.
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CIRCLE 25

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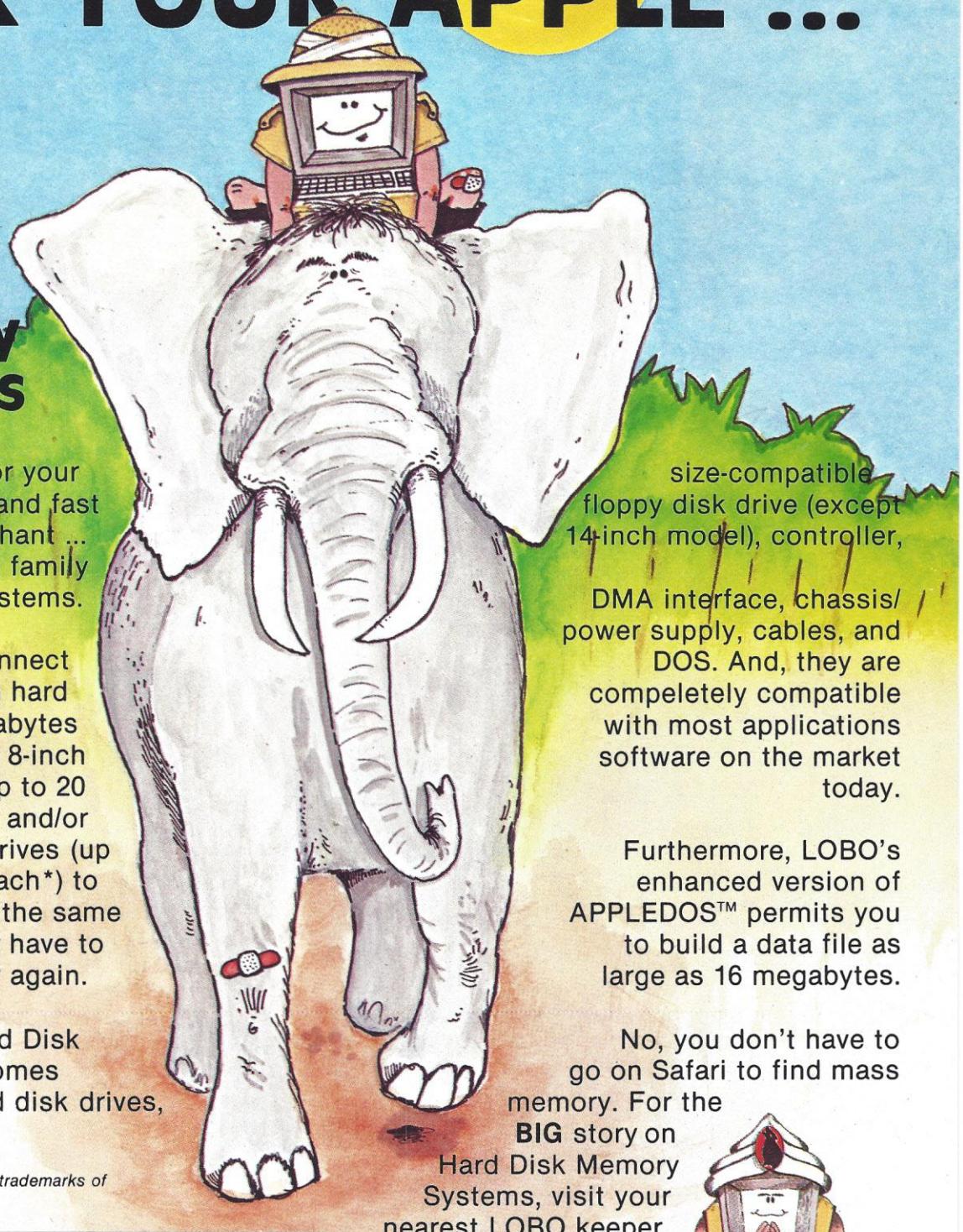
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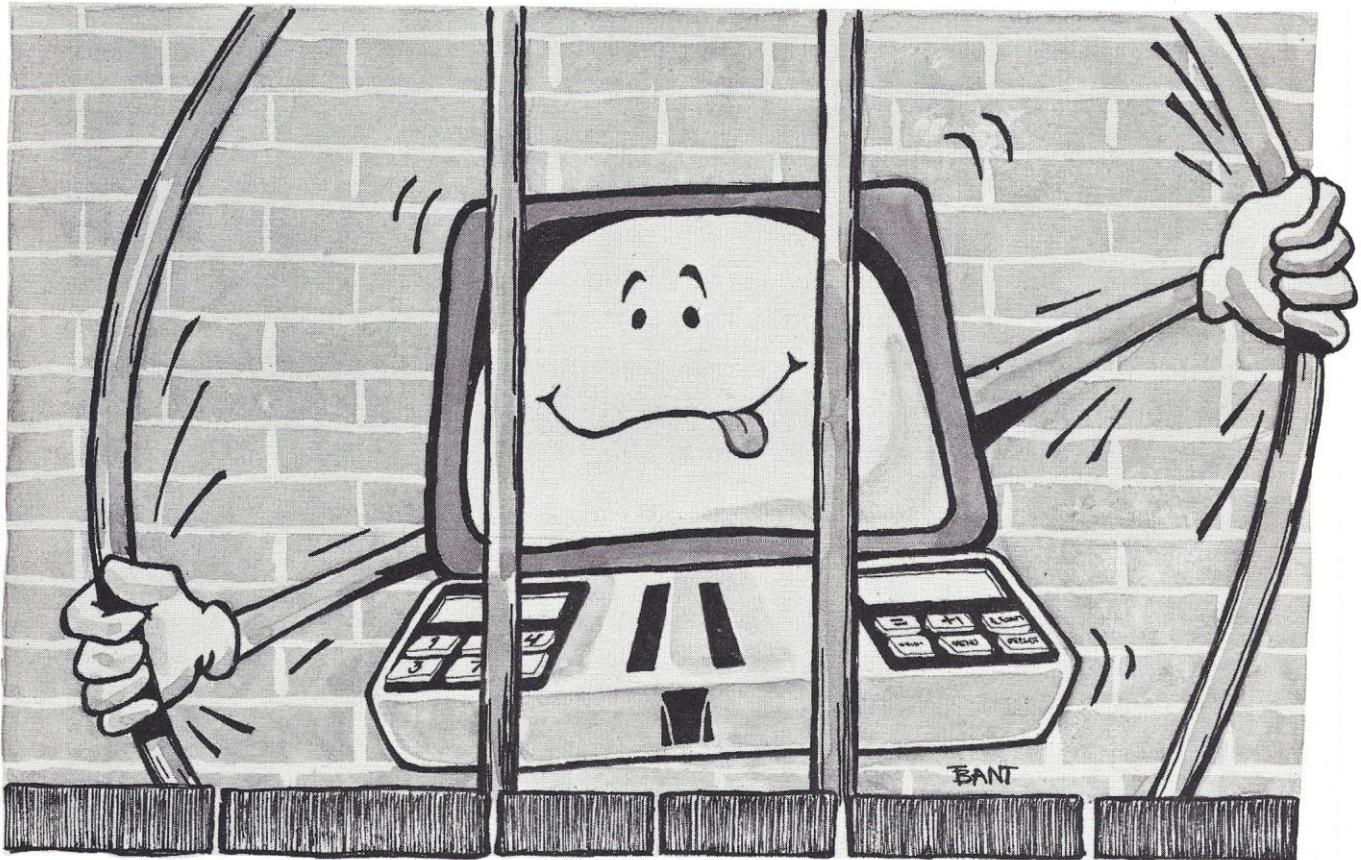
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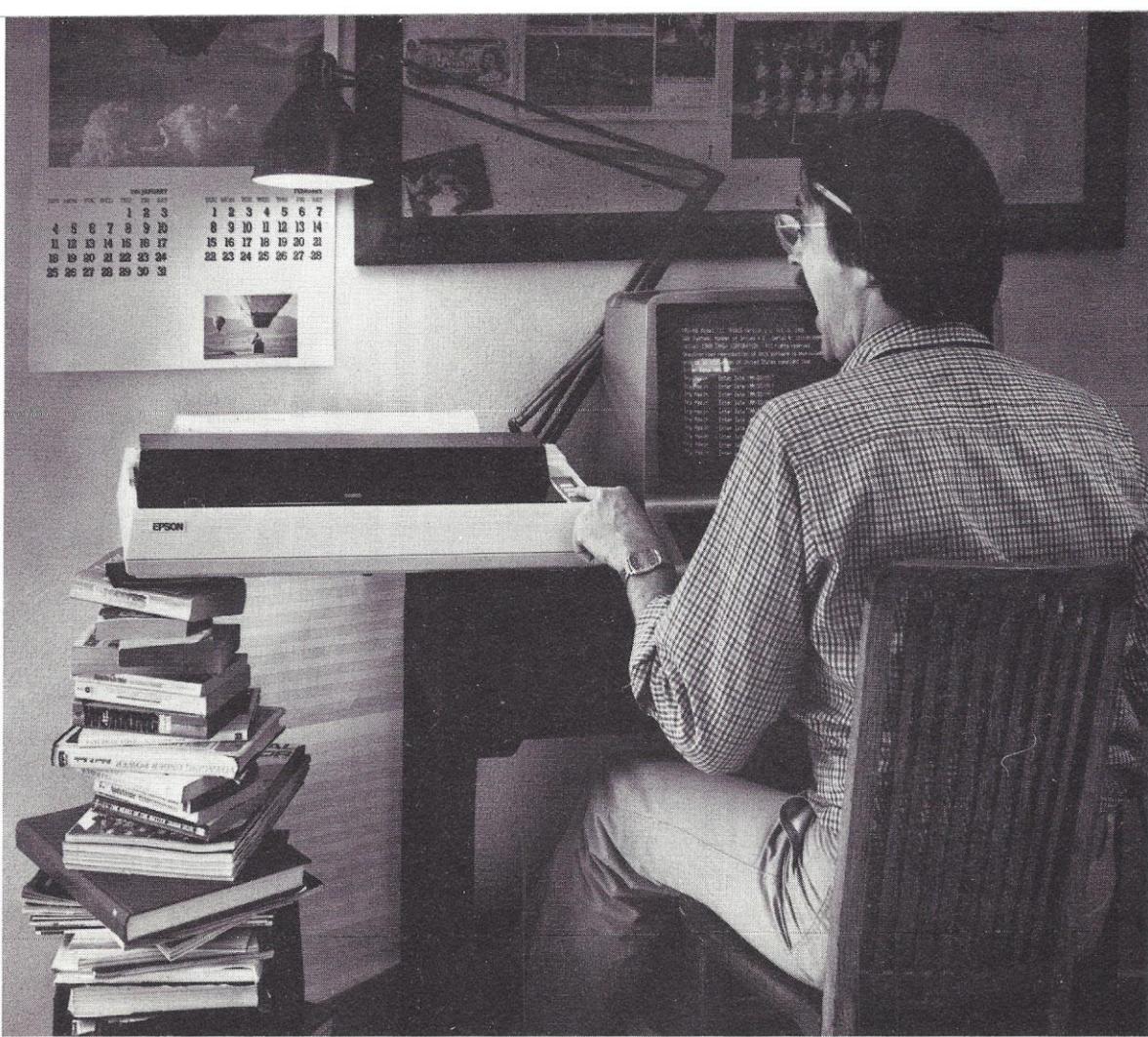
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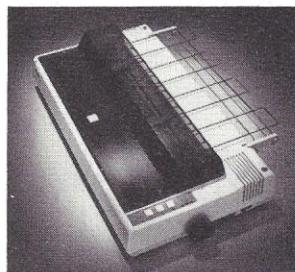
The MX-100 is a printer that must be seen to be believed. For starters, we built in unmatched correspondence quality printing, and an ultra-high resolution bit image graphics capability. Then we added the ability to print up to 233 columns of information on 15" wide paper to give you the most incredible spread sheets you're ever likely to see. Finally, we topped it all off with *both* a satin-smooth friction feed platen and fully adjustable, removable tractors. And the list of standard features goes on and on and on.

Needless to say, the specs on this machine — and especially at under \$1000 — are practically unbelievable. But there's something about the MX-100 that goes far

beyond just the specs; something about the way it all comes together, the attention to detail, the fit, the feel. Mere words fail us. But when you see an MX-100, you'll know what we mean.

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CIRCLE 28

ADVANCED COMPUTING

Compress That Program

Running out of room in program memory? Using too much disk space? This program packer removes unnecessary spaces from BASIC programs so those problems are eliminated.

DESPACE is a utility routine which removes all unnecessary spaces and line feeds from a BASIC program. DESPACE allows the user to write a program in an easily readable format, and then have the computer prepare a compressed working copy. The expanded version is retained as a file copy and is used whenever it becomes necessary to make revisions to the program.

DESPACE is designed for a TRS-80 Level II, 16K, but should be adaptable to any system with functions similar to the TRS-80's PEEK and POKE. PEEK allows you to examine the value stored in a specified memory address. POKE is used to insert a value into a memory address.

The rules

DESPACE makes use of the following rules that Level II uses for storing BASIC programs in memory: 1. Program memory begins at RAM address 17129 on power-up. 2. RAM address 17128 always has a value of zero. 3. The first two bytes of every line serve as a pointer to the address of the beginning of the next line. 4. The third and fourth bytes of every line record the line number. 5. Values of pointers and line numbers are calculated by multiplying the second byte of the pair by 256 and adding to this the value of the first byte.

Program Listing

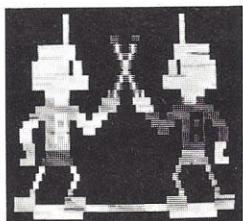
```

55000 REM DESPACE
55001 REM FOR TRS-80 LEVEL 2, 16K
55008 REM

DON WOOD, R.I.A.
188 DROMORE AVE.
WINNIPEG, MANITOBA R3M 0J3
CANADA

55010 DEFINT B - Z
55100 FOR X = 17128 TO 32700
55113 POKE X, PEEK (X + SD)
55114 IF PEEK (X) > 0 THEN 55170
55115 X1 = PEEK (X + 3 + SD) : X2 = PEEK (X + 4 + SD) :
POKE X + 3, X1 : POKE X + 4, X2 : A1 = X1 + X2 * 256
55116 PRINT "DELETIONS SO FAR "; SD :
PRINT "LINE NUMBER "; A1; :
IF A1 = 55000 THEN 55300
ELSE X = X + 4 : DW = 0 : D1 = 0 : D2 = 0 : NEXT X
55170 IF PEEK (X) = 34 THEN DW = DW + 1 :
IF DW = 2 THEN DW = 0
55171 IF DW = 1 THEN NEXT X
55175 IF PEEK (X) = 147 THEN D1 = 1
55176 IF D1 = 1 THEN NEXT X
55180 IF PEEK (X) = 136 THEN D2 = 1
55181 IF PEEK (X) = 58 THEN D2 = 0
55182 IF D2 = 0 THEN 55190
55183 IF PEEK (X) < > 32 THEN NEXT X
55184 IF PEEK (X + 1 + SD) = 136 OR PEEK (X - 1) = 136
OR PEEK (X - 1) = 44 THEN SD = SD + 1 : X = X - 1
55185 NEXT X
55190 IF PEEK (X) = 32 OR PEEK (X) = 10 THEN SD = SD + 1 :
X = X - 1
55200 NEXT X
55300 PRINT : PRINT "TOTAL DELETIONS "; SD
55315 POKE X + 1, 0 : POKE X + 2, 0 : POKE X + 3, 4 :
V = X
55320 PRINT "CHANGING LINE POINTERS " : L1 = 17129 :
FOR X = 17133 TO V
55330 IF PEEK (X) = 0 THEN NV = X + 1 :
POKE L1, NV - INT (NV/256) * 256 :
POKE L1 + 1, INT (NV/256) :
L1 = X + 1 : X = X + 4
55350 NEXT X : PRINT "POINTERS CHANGED" : V = V + 3
55500 PRINT, "NOW POKE 16633, "; V - INT (V/256) * 256 :
PRINT, "POKE 16634, "; INT (V/256) : CLEAR 50

```


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By Leo Christopherson from Acorn. Your 'droid has already learned NIM, so now it's time to teach it how to wield a laser sword! Leo Christopherson, author of "Android NIM," "Dancing Demon" and other animations, has developed a new type of animation and high-quality sound in his latest work.

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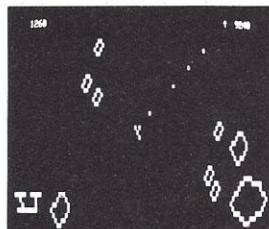


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TRS-80 Level II 16K
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**SUPER
NOVA**

By Bill Hague from Big Five
Asteroids surround your ship. You must shoot the asteroids, as well as any alien spaceships. Written in fast machine code, this game is GREAT!

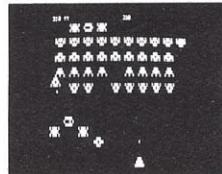
You may encounter five different kinds of alien ships, including the very deadly flagship. You shoot from your ship's position, rotate it, use your thrusters to move -- if you are overwhelmed, you can even get away to hyperspace. Fast and exciting.

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By Hogue & Konyu from Big-Five
"The rage of the arcades" is now available for TRS-80! Exciting sound effects add to the action as the invaders swoop down to destroy your base. Even while you have your hands full battling the aliens, you have to watch out for the Flagship! Super graphics, super action, super fun!

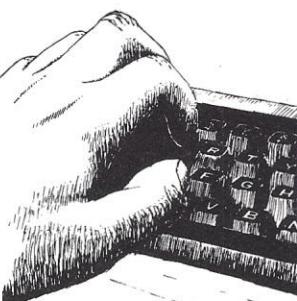
Level I or II, tape...\$14.95

PINBALL

By John Allen from Acorn
Get your flipper fingers ready for action in this real-time, machine language game.

Lots of sound and flashing graphics make this fast action game so much like the real thing that you'll have to remind yourself not to shake your TRS-80. Choose from five playing speeds to match your skill. Can you beat your friends' scores? Will you avoid the dreaded "Bermuda Square?" Get PINBALL today and find out.

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TYPING TUTOR


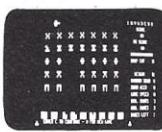
By Ainsworth & Baker from Microsoft
Speed up your programming and word processing with this excellent touch-typing instructional program. Divided into two sections, the program first teaches proper finger positioning. You practice keying various characters, the program adding new ones as you progress. In the practice paragraph section, you are evaluated for accuracy and rated in words per minute. The program continuously adjusts to your increasing skill, telling you which characters you miss and where you are slow. One of the most practical programs we know of for TRS-80.
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from Disco-Tech
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Disk.....\$29.95


**INVADERS
FROM
SPACE**

by Carl Miller from Acorn
A fast machine language approach to this classic (and addictive) space game. As you play, the aliens drop bombs, move from side to side, and try to overrun your bases. Hold them off -- and score -- by shooting them down. But, just as you think you've got it all under control, the action speeds up.

Choose the game speed, enemy bomb frequency and accuracy, shots on screen and the number of your bases. Move your base and simultaneously fire at the invaders -- you cannot do this in most similar games. Full sound effects add even more excitement to the incredible speed and action of INVADERS FROM SPACE. Fun for all ages and skill levels.

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6. The end of a line is indicated by a zero byte. 7. The end of the program is indicated by two more zeros.

The program

Lines 55100 to 55200 operate a FOR/NEXT loop to PEEK at program memory, searching for spaces (ASCII code 32) and line feeds (code 10). Line 55113 eliminates them by POKEing the rest of the program forward one byte for each unwanted character found. Since not all bytes with values of 10 or 32 represent unwanted characters, there are a few tests a byte is subjected to before it is eliminated.

As mentioned previously, the first four bytes of every line are pointers and line numbers. Line 55116 skips over these bytes by incrementing X by four whenever 55114 finds a line end. The two bytes which contain the line number ($X + 3 + SD$ and $X + 4 + SD$) are moved forward by line 55115, but the pointers are ignored. They will be recalculated later. Lines 55170 to 55176 bypass statements within quotes and remarks (code 147).

Lines 55180 to 55185 subject DATA statements to the special handling they require. In the TRS-80, string data doesn't have to be enclosed in quotes unless the string contains colons, commas, or leading spaces. Individual data items in a data statement are separated by commas (code 44). Once D2, the DATA flag, is turned on, DESPACE removes only those spaces which are not within quotes and which appear immediately after the DATA token, a comma, or a set of closing quotation marks. The DATA flag is turned off at the end of each line or when a colon (code 58) is found. The TRS-80 uses a colon to separate statements on multi-statement lines.

Lines 55113 and 55190 perform the actual despacing operation. Each time 55190 encounters a character to

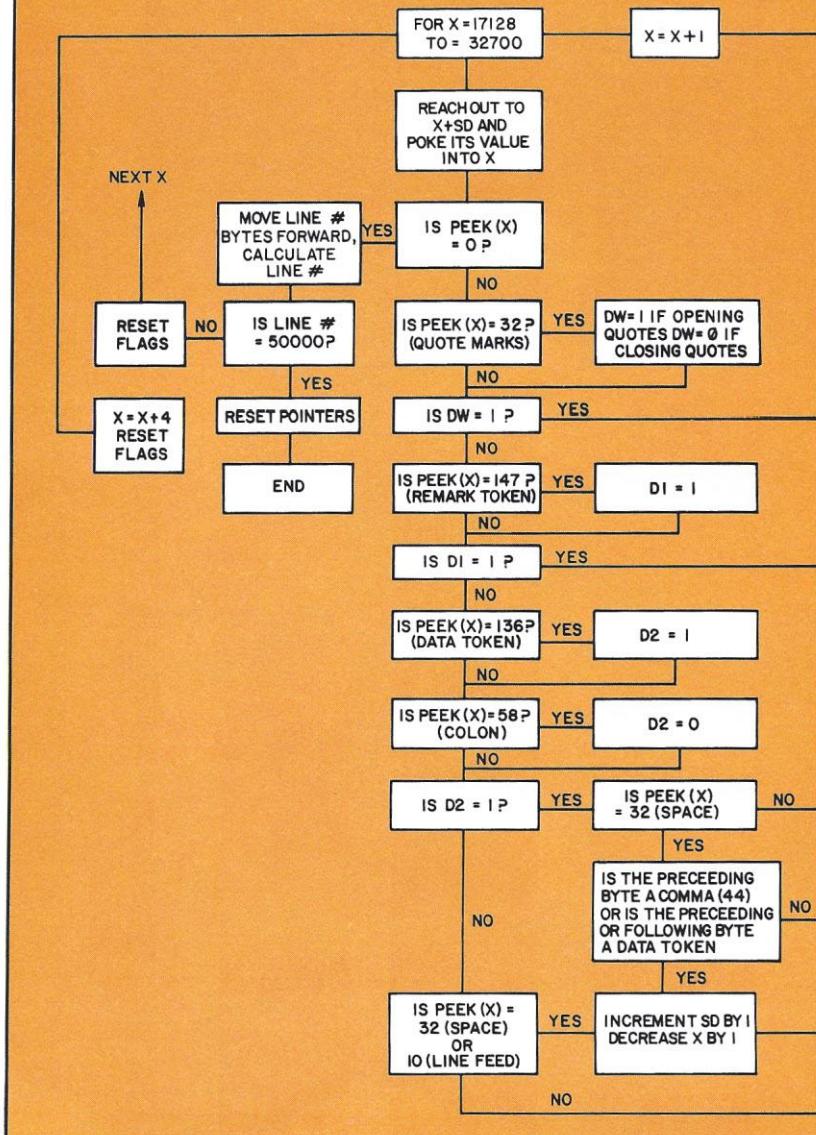
be eliminated, SD is incremented by one. X is decreased by one so that, after the NEXT is executed, it will have the same value on the next pass through the loop. Line 55113 eliminates the space contained by byte X as it reaches out one additional byte when moving the program forward. When line 55116 finds that DESPACE has reached its own FIRST line, control passes to 55300.

Line 55315 inserts the Level II end-of-program message into the new end location.

During the despacing operation, the line pointers were not changed to reflect the compression of the program. Lines 55320 to 55350 reset these pointers by searching for the beginning of each line (NV) and POKEing its location into the first

continued on page 128

Program Flowchart



LEISURE COMPUTING

Computers Put You In The Game

All the computer-game programs around have one common feature. They allow the players to get into the action in ways never before possible.



The single most important development personal computers bring to the world of games is the person-machine participation that the machines allow. Because of this element of human-machine interaction, personal computers offer you more control of your leisure time. You can actively engage in recreation without having to rely on the availability of someone also willing to play.

Participation by both person and machine in the playing of a game takes many forms. Depending on the type of game, a person's actions may vary from simple coordination re-

sponses such as the shooting of targets in arcade programs to mental responses entered into the computer by way of moderately complex English sentences. The machine, on the other hand, can participate by being an enforcer of rules, a logical opponent, a presenter of what one sees or hears during the game, and even a tutor if the programmer who wrote the game is more skillful than the player.

The variety of elements that a machine can provide to a player of a game, and the ranging responses required of the player to interact with those elements in any particular instance, can be mixed in a number of

combinations resulting in a large body of personal computer programs referred to as "game software."

In general personal computer game software can be divided into three categories: strategy games, adventure games and action/arcade games. A sampling of those that can be played on Apple, TRS-80, Atari and other microcomputers follows:

Strategy Games

All the traditional card and board games, such as chess and checkers are included in this category, as are war games.

Strategy games were the first to take advantage of the microcom-

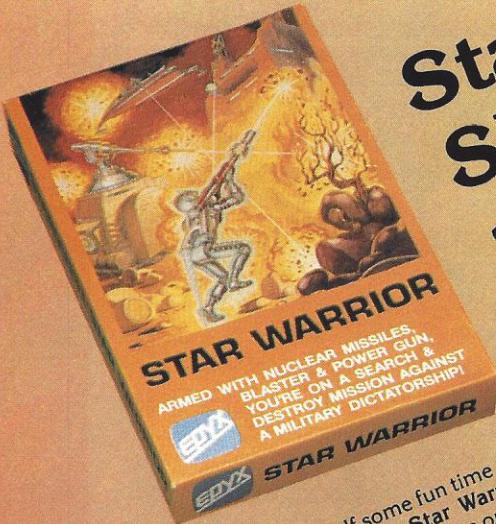
puter. Almost as soon as the Apple was on the market, roulette games and blackjack programs sprang up in abundance. But for the most part, these first-generation games were totally textual in presentation and did not use the graphic potential of the Apple.

Now, instead of just being told, for example, that a card is the 9 of spades, the card itself is displayed on the screen. Roulette programs now feature a little ball moving a circular path around the wheel. Graphics have added color and interest to the games.

In chess the first program to make it big was *Microchess* by Peter Jenn-



Star Warrior: Slay the Dictator and Save the Civilized People



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enemy may not see you either.) There is always the chance of an attack by an invisible enemy. There are two scenarios and five levels of difficulty...level five is almost impossible to win. There are usually no fixed playing times for Scenario 2; you play until you get the governor and escape or until you are killed.

But you can even set a fixed playing time in Scenario 1.

You have the choice of suits and equipment, and of movement, combat, and of special commands.

In other words, like all EPYX games, there are enough variations in the game so that you will never tire of playing. Each game is different and fresh. You will never get bored or fresh. You game. Not in your or your computer's lifetime.



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enemy may not see you either.) There is always the chance

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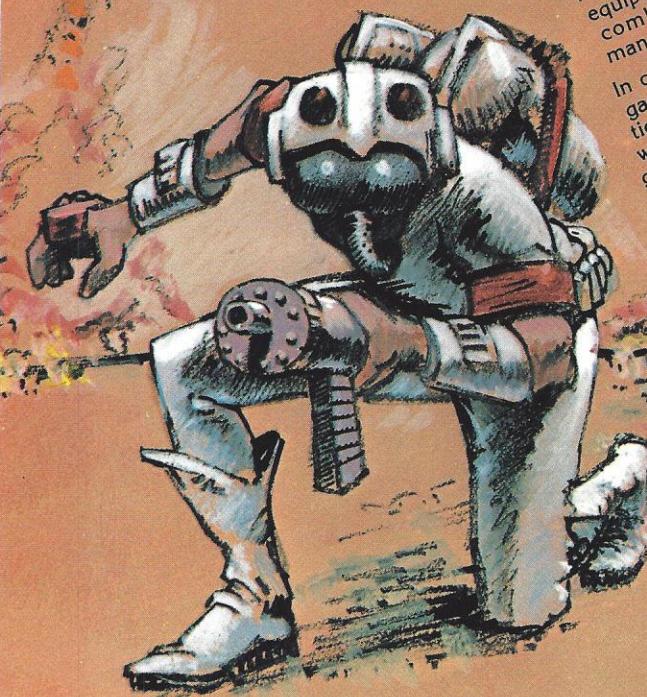
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ings, published by Personal Software. Following this have come **Sargon** and **Sargon II**, both by Dan and Kathe Spracklen and published by the Hayden Book Co. These programs feature graphics that present recognizable chess pieces. Multilevel settings allow the games to challenge both amateur and more professional players.

All the standard rules of chess apply to these programs, as well as options to start the game from any board position desired. The program keeps a move-by-move list of all plays made during the game. When the program makes a move, the piece flashes on the screen and is moved to its new position. The player moves a piece by entering the square that the piece is on, followed by the square to which it is moving. Computer chess has been going strong for almost three years, and there is no sign of a slowdown in its popularity.

Bridge, however, has thus far been a stumbling block for programmers. No product yet on the market simulates a bridge game nearly as well as Fidelity's **Bridge Challenger**, a stand-alone hardware device. Unlike chess, with only two players, bridge poses a vastly more difficult problem in program tree structure, because of its four players. But surely if a microcomputer can make it to outer space, it will be able to play bridge in the near future.

Fastgammon by Bob Christiansen, published by Quality Software is probably the most popular of all the microcomputer backgammon games. It features an excellent high-resolution playing board, complete with color, where applicable, and sound. The game is a good opponent, winning its share of games but allowing the player to win enough to sustain interest.

A fun and creative version of an old game called Nim is **Android Nim**, by Leo Christopherson. The player tries to force the opponent to

remove the last piece from the board to win. But now there are android executioners who politely nod in acquiescence to the player's command and fire at the androids the player wants removed.

Don't try to cheat. The android executioner will simply shake his head, "no," in defiance of any illegal command. Even if Nim is not one of your favorite games, you may find it hard to resist at least smiling at the rather expressive androids.

“ **Everything is in the player's control, including the scheduling of repairs. If the plant is run successfully, the company profits.** **”**

A strategy game that is enjoying a new wave of popularity is Othello. Again, Kathe and Dan Spracklen have created a championship program, **Reversal**, also published by Hayden. The program follows all the official tournament rules of Othello and allows the player to select one of three playing strategies for the computer, as well as one of nine difficulty levels for each strategy. (There are many other good Othello programs, like the one from Instant Software.)

Reversal also features a rather amusing touch graphically. All of the pieces belonging to the team that is winning have smiles on them, while all of the losing player's pieces have frowns. The bigger the lead, the larger the smiles. For tournament play, the faces can be wiped off, leaving just solid black and white pieces.

The Spracklens worked closely with Jonathan Cerf, the current world champion Othello player, in devising the strategies for the game. Like Sargon II, Reversal also allows

the player to set up the board in any position and to play from that point.

Another interesting strategy game type is the simulation. Probably the most famous is **Hamurabi**, where the player tries to rule an ancient kingdom for 10 years without running the country into the ground. Many variations are on the market today. Most, however, are purely text and have not yet truly made use of graphics.

One simulation program that is almost too real to call a game is the **A2-FS1 Flight Simulator** from Sublogic. The "player" is in the cockpit of a plane, and has a 3-D view of what is outside. Participants have complete control of throttle, ailerons, elevator and rudder and get a feel for what it is like to fly. The simulator allows the pilot to take off, fly and land the plane.

But there is more. Once a pilot has mastered the art of flying, he or she can then play the **British Ace Aerial Battle Game**, another program by Sublogic, in which the object is to destroy the enemy's fuel supply while trying to evade or shoot down enemy fighters. All together, the Flight Simulator is one of the most innovative and exciting simulation games to appear so far on the home computer market.

A simulation game that has enjoyed a great deal of critical, as well as popular, success is **Three Mile Island** produced by Muse. The player is put in charge of operating a nuclear power plant. Everything is in the player's control, including the scheduling of repairs. If the plant is run successfully, the company will make a profit and all will be well. But one wrong decision, and the player may find Three Mile Island heading for a meltdown.

The power plant is featured on several different screen pages in low-resolution color graphics. The player controls every valve, pump and turbine. The color is excellent. When



Atari graphics and sound stand in a class by themselves."

*David D. Thornburg
Compute Magazine, November/December
1980*

"Its superiority lies in three areas: drawing fancy pictures (in color), playing music, and printing English characters onto the screen. Though the Apple can do all these things, Atari does them better."

Russell Walter
"Underground
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water is flowing through the pipes, for example, the pipe turns blue. Occasionally inspectors appear to examine the plant's equipment. Sometimes repairs are needed, and this can be quite devastating if the player has not prepared for all possibilities.

The game is played against a clock. Demands for electricity change at various times of day, and the plant manager must continually monitor the needs of the community to upgrade or downgrade the power output so maximum profits are obtained for the power company.

Another entire area in the strategy-game field is sports games. These are actually a combination of strategy and simulation games, in that one player is representing a full team. Two or three years ago most sports games were all text. Today, programmers put the team members on the screen and move them. Atari for example has produced such a cartridge, **Basketball**, for its computers, the Atari 400 and 800.

A very detailed basketball court is drawn on the screen. Depending on the options selected, the game can be played by one, two, three or four players using Atari joysticks. Team members move smoothly across the court in response to inputs. Each team member not only can dribble and run, but also can shoot and jump to block a shot. The action is fast, and when played against the clock, the game is exciting.

Yet another excellent sport program is **Olympic Decathlon**, published by Microsoft. This is a realistic simulation of the decathlon events. The game allows as many as eight players to participate. The TRS-80 game has excellent graphics.

Most of the games require the alternate hitting of two keys to represent a person running. The figure moves in direct relation to the evenness and speed of the strides made on the keyboard. In the pole vault, for example, the figures take a running start toward the high bar. By press-

ing a certain key, the player lowers the pole to meet the ground (hopefully in the pit next to the bar.) The figure then moves up and, with a little luck, goes over the bar. Don't miss, or you may find your figure head first in the pit.

A nice feature of the entire package is the practice rounds given to the players. This is very important because, like the real events, timing is critical to get the winning touch, and practice can make perfect. The game also allows for solo play by scoring a player on each round, so that even in a field of one contestant, there is still the chance to top the last score.

War games are also very popular. The high degree of strategy and planning required will often lead some players to spend more time on a critical move than a chess player might. The player faces weather problems, rationing, unfamiliarity with the territory occupied and more. In short, everything that a



general must consider before deploying troops. This much data makes such games a natural for the computer.

One of the newest and nicest of these games is **Operation Apocalypse**, —the game—actually four games in one package—simulates major World War II land operations, with land area done in high-resolution color graphics. The computer can play the side of the German forces, while the player takes command of the Allies. The player can try to conquer and hold major towns by using tanks, infantry, artillery and engineer battalions.

Another game in the set allows the Allied player to attempt to land on the shore and invade the enemy territory by cutting through the defenses set up by Germans on beach

front areas. Like all war games, Operation Apocalypse requires the player to take considerable time to learn all the rules. But this patience is rewarded with a very fascinating game.

Meanwhile Avalon Hill is coming out with computerized versions of many of its famous board games. One favorite is **Aquire**, originally created by Sid Sackson, one of America's leading game designers. The game pits the players against one another in fierce competition to acquire and then sell majority holdings in certain hotel stocks. The strategy for this game is quite complex and will give many players a run for their money.

As in the real world of financial wheeling and dealing, timing is critical. Players must take care in decid-

ing which stocks to buy and which to pass up or sell. A hotel chain that appears to be the biggest early in the game can easily become unimportant by the game's conclusion.

Adventure Games

In an adventure game the player is placed into a story. As the story opens, the player is given certain information. For instance, "You are standing on a dirt road. There is a path to the north and a more traveled road going to the west." At this point the game stops and waits for the adventurer to enter a command.

The computer acts as the player's five senses and will report the results of the last command. In the above example just given, if the adventurer enters "walk east," the game will

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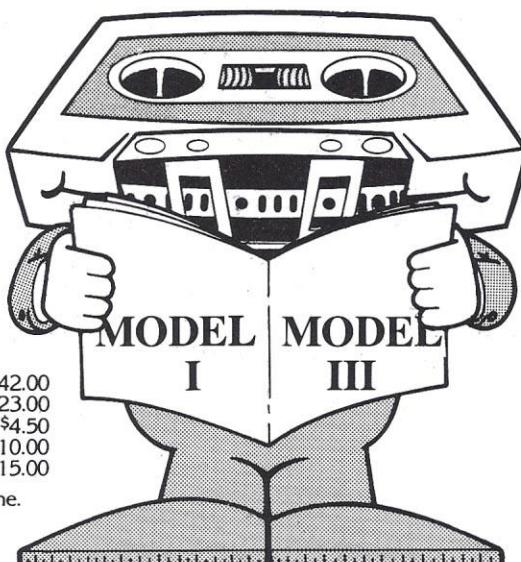
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by Clyde Cload, star reporter



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probably respond with "you cannot go in that direction," since the player has been told the road goes west and a path runs north. If the player enters "walk north", the game will tell what is encountered along this route. Traditionally the adventurer enters commands in one or two-word sentences.

Adventure games have become enormously popular in the last few years. Growther and Woods introduced the first such game, which was even called **Adventure**. It was developed on a mainframe computer and became so popular that it quickly spread from installation to installation. The goal was to collect treasures and return them to the starting point.

The first adventure game was totally text, but it was written in a style

so rich in description that a player had no trouble imagining a threatening dwarf or walls that "are frozen rivers of orange stone". Since its release, Adventure has been adapted for virtually all home computers.

The next major force on the adventure game scene was Scott Adams, a prolific program writer who has just released his 10th adventure game, **Savage Island**. All of the games in his series are produced by Adventure International and are challenging and fun. Often the purpose of items found is well disguised, and only the truly ingenious adventurer can discover the true purpose. What these adventure games miss in graphic detail, they make up in variety of theme and in the clever puzzles and tricks that are continually thrown the player's way.

One of the new companies producing high-quality adventure programs is Automated Simulations. Actually the term adventure no longer really applies. The genre has expanded into fantasy games, which include traditional adventure as well as role-playing games, such as Dungeons and Dragons. Automated Simulations' most popular game, **Temple at Apshai**, shows the shape of a room, the locations of doors, etc., plus monsters when they appear on the scene. The game is a pure fantasy. Beginning with an Innkeeper, the player creates a character and outfits the character with weapons and other devices as the player sees fit. The player then travels to the underground world of the Temple, where great treasures are protected by hungry monsters and hostile

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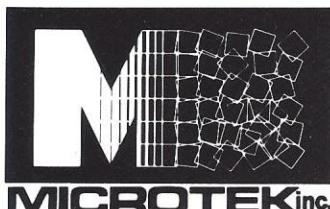
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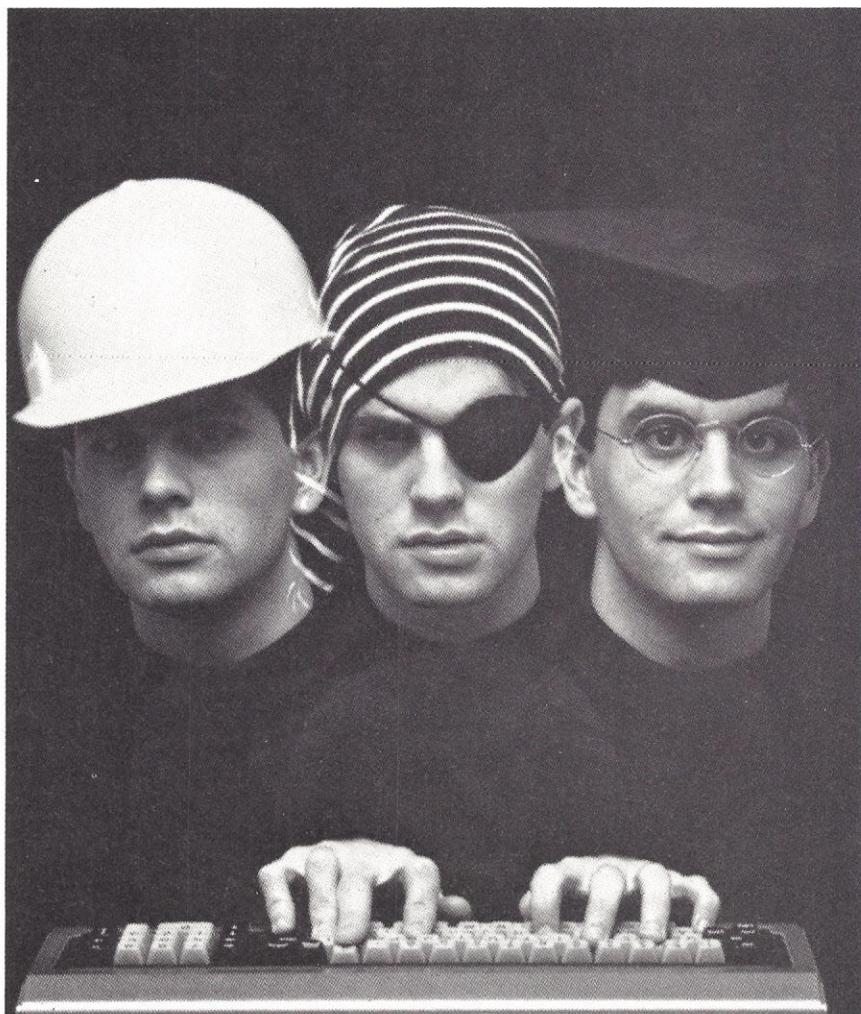
demons. The goal is to collect as much treasure as possible and return with the booty to the Innkeeper.

Another popular Automated Simulations game is **Rescue at Rigel**. The setting is a remote region of outer space. The mission is to find the hostages hidden in the alien complex and to return them all to a spaceship and freedom. Gone is the old-fashioned axe, and instead we find blasters, powerpacks and transporters. The game also features a real-time clock with a one-hour limit to complete the mission.

Another interesting idea in adventure games has been advanced by On-Line Systems. Here we have the standard adventure format of commands in two-word sentences—for example—GO NORTH combined with pictures as well as a text description of the locale. When a player gives the command LOOK KEY-HOLE, he or she actually sees what is on the other side of the door. Often it is certain doom. One picture of a scorpion hiding under a rock is worth many lines of description.

In yet another major advance in adventure games, full-sentence commands are available with **Zork** produced by Personal Software. The game seems to have an extensive vocabulary and seems able to understand many ways of saying the same thing. The descriptions used are vivid and detailed, since the game is disk interactive and therefore can give more text in each room.

Another innovative product is **Interactive Fiction**, developed by Robert LaForce and sold by a company called Interactive Fiction. The player is given a character to play in a story. As the narrative unfolds, the computer stops and waits for the player to respond wherever that character is involved. For instance, if a colonel of the Third Reich armed forces asks how the player's character is enjoying dinner, the game



stops and waits for the player to enter a reply. Depending on the answer, the story continues. If the player displeases the colonel too much, the player may end up in front of a firing squad. If the colonel likes the player, riches and a high rank in the military may be the reward.

At present several short stories are available, all interesting and well-written. It could be just the beginning of a whole new series of games.

Action/Arcade Games

There is scarcely a shopping mall or resort town that does not have an electronics game. Even pinball games, thanks to the microprocessors, now employ digital displays, music synthesizers and sometimes

speech responses. The "arcade games" for personal computers, for want of any other name, usually cast the player in the role of defender against some sort of alien attack. The player is given various amounts of ammunition and, by careful maneuvering, attempts to destroy the enemy before the enemy destroys the player.

The first of these games to sweep the home-computer market was the now classic **Space Invaders**, made by Atari. The game turned up first in public arcades. The Invaders travel across the screen from right to left. Every time they hit the end of one row, they drop one level closer to the player's home bases. If one of the

continued on page 128

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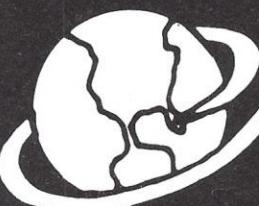
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Payroll

continued from page 21

as sick pay. Only five of the 15 packages—BPI's to name the easiest—allow the user to include nontaxable wages from the withholding tax calculations. This is a very serious shortcoming, because it means not only that many employees, but the company as well, pay too much in Social Security taxes in such cases.

Software authors apparently do not know or recognize the importance of the employer's contribution to Social Security. Employers pay the same amount in Social Security taxes that employees pay, 6.5 percent in 1981, 6.7 percent in 1982. And if a payroll program deducts Social Security taxes for sick pay or any other type of nontaxable pay, the employer ends up matching that amount. To recoup those extra taxes can be a hassle for both the employer and the employee. It can also be troublesome for the employer in a different way: the Internal Revenue Service directs employees to employers for refunds of overpaid Social Security taxes in most instances.

Only one package, the BPI Systems, actually flags excess Social Security and Federal withholding tax deductions; it publishes a separate report describing the totals of these excess deductions, and the excess deductions are also shown on each employee's earnings record and master file.

Excess withholding can occur in income, Social Security and unemployment taxes. For example, this year Social Security taxes should not be withheld on any income above \$29,700. If an employee makes \$35,000 a year, as soon as Social Security taxes have been withheld on \$29,700, the payroll department should stop withholding the money. Unemployment taxes work similarly, but with much lower limits.

Excess income taxes can be withheld when the wrong tax rate is applied or a person is credited with too few exemptions.

Wages and salaries. Each package has a provision for hourly and salaried employees. Almost all allow for overtime (usually calculated as 1.5 times regular pay) and double-time (2 times regular pay), while one allows for triple time. Most packages allow only one rate of pay (such as \$4.50 an hour) to be calculated for each employee. However, a few allow for up to four different hourly rates, an important advantage in companies where employees may work different jobs at different pay rates. Only one salary calculation at a time is usually included.

Commissions and piecework. Six packages include some means of computing commissions for sales personnel. A few include up to four ways, although the two usual ways are to separate the commission earnings or to calculate commissions as a percentage of commission, base pay plus a piecework rate, or a user-defined method.

Tips. Only three packages—BPI, CPI, and Structured Systems—include calculations for tip income. This difference is crucial to restaurants, hotels, or any other business in which employees must report tips for Social Security tax purposes. Reporting tips for state withholding taxes is important, too; some states require taxes to be withheld from tips, while others do not. Lumping all tip income together would be as wrong as leaving it out altogether.

Earned income credit. A few packages include the special Federal earned-income credit that gives low-income workers special Federal tax credits, which they can receive in the form of checks from the Government if they do not owe taxes at the

end of a year. This is also known as a negative income tax.

FORMS PRINTING

Almost all of the packages print tax forms at the end of each quarter and at the end of the year. These forms are the W-2 statement of earnings and withholding taxes and quarterly 941A tax return, which summarizes all the company's pay and Federal income tax payments for the preceding three months. The W-2 form includes yearly gross earnings, yearly total of Federal, state and local (if any) income taxes withheld, total Social Security taxes withheld and net earnings. It should also include each employee's number of exemptions. Generally the packages use standard forms available from any office supply store or warehouse.

PAY PERIODS

All of the packages give a business a choice of four standard pay periods: weekly, biweekly, semimonthly or monthly. Biweekly paychecks are paid every two weeks, while semimonthly checks are issued usually on the 1st and 15th or 15th and 30th of each month. However, four packages include other types of pay periods, or let the user define the company's own unique pay period.

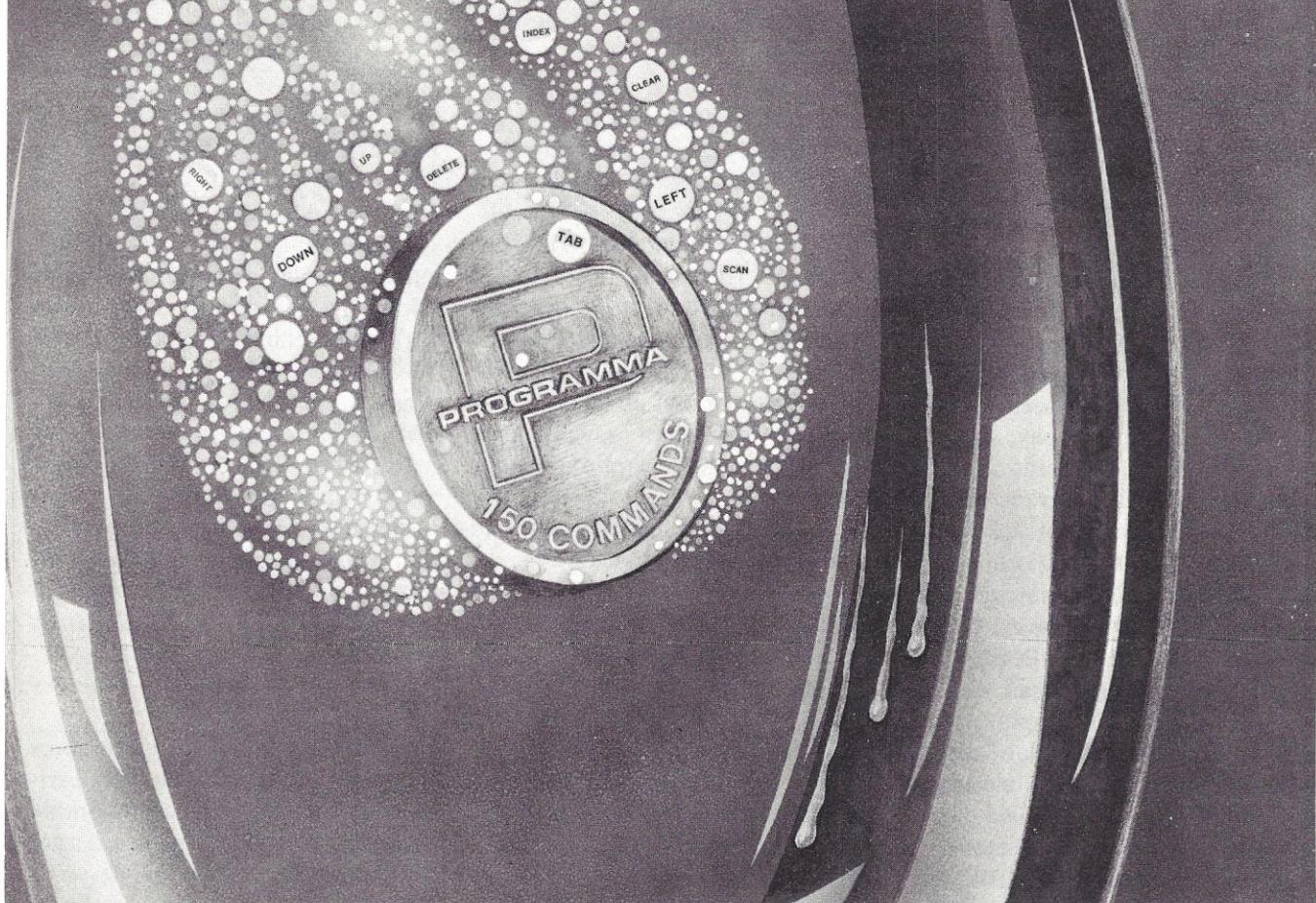
GENERAL LEDGER INTERFACE

Twelve of the 15 programs can be directly linked to general-ledger programs. Most require that the account numbers for the various line items in the payroll program correspond exactly to the line items in the general-ledger program published by the same software house. The CP/M-based programs with the interface also link the package to other

continued on page 111

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Formatter

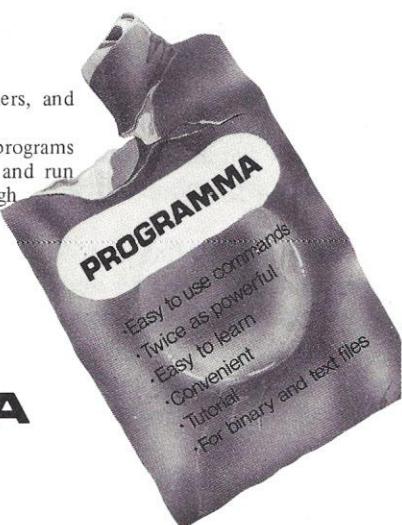
margins, headers, footers, even form letters, and includes a proofing capability.

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COMPUTER CHESS

Anatomy of a Chess Program

Chess doesn't have to be written in machine or assembly code. This version has been done in BASIC

A computer chess program in BASIC? There is at least one advantage to doing it this easy way instead of in a more difficult assembly language: you can clobber the program to your heart's content and not have to worry about hurting its feelings.

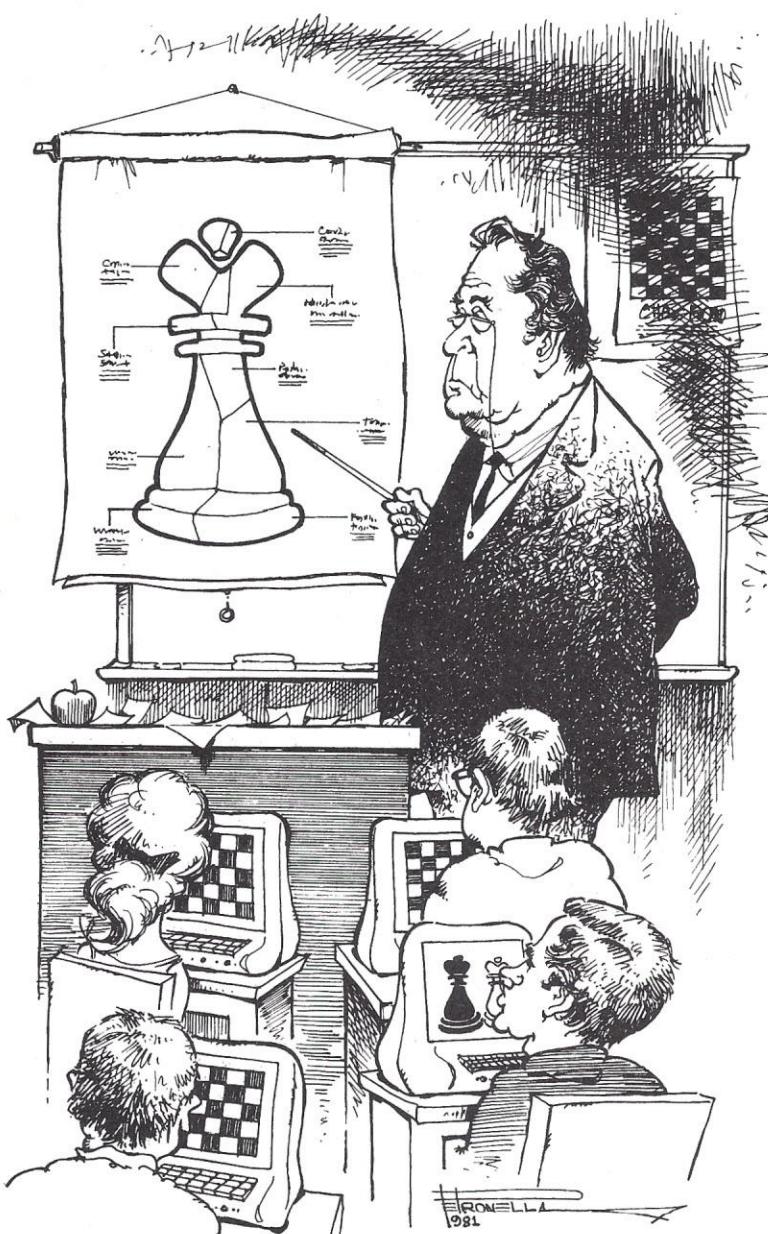
Actually, when I started writing this program, I intended it to be only a trainer for chess openings. It does this very well. The size of its opening repertoire is limited only by the size of the computer memory.

Once it leaves its book openings, however, the program becomes a very poor player. This is because BASIC is an interpretive language, and interpretive languages are very slow compared with languages that are assembled or compiled. If you want a BASIC program to respond in a reasonable time, you cannot have it go through a lot of involved calculations.

Trial and error

Even if you want to write a chess program in assembly language, it might be a good idea to try it first in BASIC. That way you can find out if your ideas work before you put them in the more difficult language.

My program was written on a Radio Shack TRS-80 Model I disk



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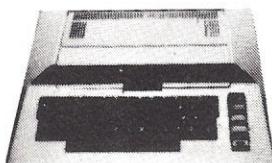
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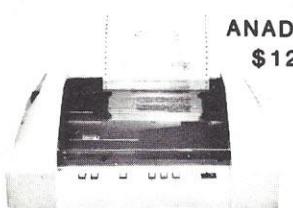
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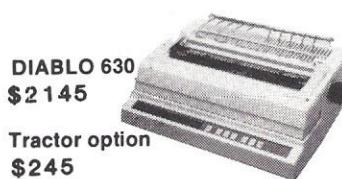
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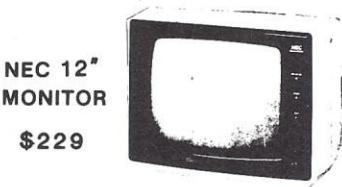
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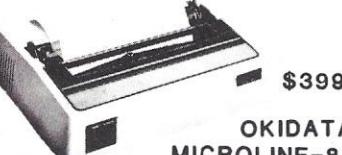
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system. The program is a little over 16K long. If you take out the comments, the instructions for the printer and the unnecessary spaces in the program lines, you might be able to fit it into a TRS-80 Model I Level II with a 16K memory.

The program plays only the Black side. Modifications must be made if you want to have the program play the White side as well. I'll leave that exercise to you with the following advice: perhaps the easiest way to do it would be to have two versions of the program, one for playing the White pieces and the other for playing the Black pieces.

If you do have two versions and plenty of computer memory, you might try putting both programs in the computer at the same time and have them play each other. This would be good for comparing different evaluation subroutines. It doesn't matter that these programs don't look ahead several moves. An evaluation subroutine that works better for a short look-ahead will also work better for a long look-ahead.

Table of contents provided

Lines 10 through 90 of the program serve as a table of contents. Only the first GOTO is functional. The rest serve only to reference different parts of the program.

Lines 140 through 610 are executed only when the program is started. Lines 180 through 370 set up the initial positions of the pieces.

Black pieces are negative numbers and White pieces are positive numbers. Note that C(X,Y) is dimensioned for a 10-by-10 array in line 160 (0 is also a possible subscript in Radio Shack BASIC). This will give a border of blank squares around the chess board, and the blank squares will simplify some of the programming.

In lines 380 through 410, BL\$, BR\$, WL\$ and WR\$ are flags that

indicate whether it is still possible for Black and White to castle to the left or right. Y represents yes and N no.

In line 420, BI\$ tells that the program is still making book moves. In lines 430 and 440, MC is the move counter and PB designates the column in which a Black pawn would be vulnerable to an en passant capture.

Lines 450 through 510 are used to ask if a printout of the moves is wanted and to set PF\$ accordingly. If you don't want to use a printer, these and certain other lines can be simply omitted.

Painting the chessboard

Lines 520 through 610 paint a chessboard on the screen. This is done completely only initially. After each move, only the affected squares are updated.

The main loop of the program consists of lines 660 through 5450. Lines 660 through 770 print the move count, enter the player's move and check the move for validity. If the move is not valid, entry is requested again. The move input must consist of four characters. The columns are lettered from left to right by letters A through H. The rows are numbered from bottom to top by numbers 1 through 8.

Entries are made in this order: first the letter, then the number of the square the piece is on and then the letter and the number of the square to which the piece is moving. The program does not check a move to see if the player is cheating.

Castling is done by moving the king two spaces to the right or left. En passant captures are made by moving the capturing pawn to the square behind the pawn to be captured. The program will automatically move the rook or remove the captured pawn.

"Promoting" the pawn

Lines 790 through 890 will ask the player to what piece he wants his

pawn to be "promoted". If he inputs something that is not recognized by the program, the program will give him a queen.

Line 920 calls a subroutine that will change the display to represent the move.

Lines 930 through 980 record which, if any, of the player's pawns are vulnerable to en passant capture. This is used in the book-opening look-up portion of the program.

Lines 990 through 1240 take care of the flags for the player's castling and set up the variables for changing the display later (line 1360), while lines 1250 through 1350 take care of any en passant captures the player might make. In line 1370 a subroutine is called that checks to see if the computer's king is in check, and line 1390 sets variable BE! to 100 when the Black king is in check. The "!" indicates a single-precision variable in Radio Shack's Level II or disc BASICs. Note that all variables have been initially set to be integer variables in line 150.

The king in check

Lines 1400 and 1410 let the player know that he has the computer's king in check, and line 1420 sets BE! to 99 if the computer's king is not in check.

Line 1430 checks the BI\$ flag to see if the computer has found the chessboard situation in its book on its last move. As soon as the computer can't find a chessboard situation in its book, it will ignore the book for the rest of the game.

Now we come to what I regard as one of the most interesting parts of this program—the book look-up. Lines 1440 through 1720 create a string that represents the chessboard situation. If you are familiar with Forsyth Notation, you may recognize that this is a variation of his method of representing a chess position. He used lowercase letters to represent Black pieces and uppercase

letters to represent White pieces. If you have an uppercase and a lowercase on your computer, you may want to do the same thing. In lines 1620 through 1670 different uppercase letters are assigned to the Black pieces. For instance, an M represents "monarch" for the Black king.

In any case, you create the string by scanning the chessboard from White's side, left to right and top to bottom. Every time a piece is encountered, its corresponding letter is added to the end of the string. If a piece is not encountered, the number of spaces between the pieces are counted and added to the string. If there are no more pieces before the end of the scan, the number is not added to the string. The status of the castling flags and the en passant variable are added to the string in line 1720.

Book can be changed

Lines 1730 through 1860 do the book look-up. If you want to expand or change the book, you may want to make a temporary change to line 1750. If you change it to 1750 IF D\$ = "END" THEN B1\$ = "N": PRINT CP\$:STOP, the program will halt when it can't find a position in its book and the string representing the chessboard situation will be on the monitor. Then all you have to do is copy the string into the program as a DATA line and add the moves from which you want the program to choose in response to that chessboard situation. Don't forget that the last DATA element must be "END".

Now would be a good time to examine a DATA line that determines what the program's response will be when it encounters a situation that is in its book. Line 8740 says that when the situation in line 8730 is encountered (White opens with pawn to king 4), the program responds with C7C5 half of the time and with

E7E5 the rest of the time.

Of course, it could have more than two possible responses to an opening situation. For instance, line 8740 could be changed to 8740 DATA C7C5,33,C7C6,22,E7E5. This would mean that the program would respond 33 percent of the time with C7C5, 22 percent of the time with C7C6 and 45 percent of the time with E7E5. Line 8780 says that the program responds with B8C6 every time the situation in line 8770 is encountered.

If you want the probability of the responses to be similar to that of a superior player, I suggest that you consult *The Blue Book of Charts to Winning Chess* by Arthur M. Stevens.

Lines 1870 through 1900 decode the chosen move into beginning and ending coordinates for the Black piece that is to be moved.

Complications set in

Lines 1960 through 4930 are probably the most complicated part of the program. When the program can no longer find the chessboard position in its opening book, it must resort to this part of the program to determine its move. Lines 1960 and 1970 along with lines 4920 and 4930 provide a complete scan of the chessboard. If the scan encounters a White piece or a blank square, the scan proceeds on to the next square (line 1990).

Now it would help if you imagine the program is actually moving the pieces about on the board. In line 2000 the Black piece is lifted from its square. In line 2010 the piece is examined to see what it is—a pawn, knight, bishop, rook, queen or king. The program branches here. If the piece is a pawn the board is examined, and all possible moves for the pawn are tried, one after the other. If a White piece is captured, it is temporarily set aside.

After each hypothetical move is set up on the board, the evaluation subroutine, GOSUB 5500, is called. After this is finished, any captured pieces are returned to the board, and the pawn is placed in its next possible move. After all the possible moves for the pawn have been tried and evaluated, the pawn is put back on its original square, line 4910, and the scan proceeds to the next Black piece.

Checkmate or stalemate

The move generation proceeds in a like manner for all the Black pieces as the scan encounters them. Note that the queen's moves are the same as the bishop's and rook's combined. After all the possible moves have been generated, the program execution moves to line 4940.

Line 4940 determines if Black has been checkmated or stalemated. If the evaluation subroutine has not changed BE! from a value of 99 or 100, no legal moves have been found and the game is over.

Lines 4950 and 4960 put CHECKMATE OR STALEMATE on the monitor screen. Lines 4970 through 5020 finish up the printer record.

Line 5030 stops the program without messing up the monitor display. And lines 5040 and 5050 are used rather than one line so that the line on the program printout won't be too long.

Lines 5070 through 5100 promote a Black pawn to a queen when it reaches the first row. Line 5130 calls a subroutine that determines if the White king is in check.

Line 5140 again calls the subroutine that changes the display to show the latest move. (See line 920.) Lines 5150 and 5160 simply puts CHECK on the monitor screen, when applicable.

Lines 5170 through 5210 determine which, if any, Black pawn is vulnerable to an en passant capture. Lines



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5220 through 5300 take care of the flags for the computer's castling.

Adding Black features

Provision has not been made for Black castling or Black capturing en passant. If you want these features, you'll have to add them to the move generation and to the program area represented by lines 5220 through 5330.

Line 5390 increments the move count. Line 5400 through 5420 put White's last move and Black's reply onto the monitor screen. Lines 5440 and 5450 do the same for the printer.

Line 5450 completes the program's main routine's loop, sending the computer back to the beginning of the loop at line 660.

The heart of the program is the evaluation subroutine. It determines how good a chess player the program is. It is also one of the most used parts of the program. Any improvement in execution time in this subroutine will improve the execution time of the overall program. This subroutine determines to a large degree how long you have to wait for the computer to make its move. Another subroutine that makes you wait for the computer's move is one called BLACK KING IN CHECK?

Lines 5500 through 5650 are the evaluation subroutine. Line 5500 is a call for the BLACK KING IN CHECK? subroutine. If the computer's trial move puts the Black king in check, it is an illegal move and must not be used.

Line 5510 causes the execution to leave the evaluation subroutine if the Black king would be in check. If BE! is set to 100 or 99 when the evaluation subroutine is entered and the Black king would be in check, BE! will remain at 100 or 99. If BE! remains at 100 or 99 for all trial moves, the program has determined that no legal moves are possible and that Black is checkmated (BE! equals 100) or stalemated (BE! equals 99).

If a legal trial move is found, the resulting chessboard situation is evaluated.

Simple evaluation employed

Lines 5520 through 5570 contain a very simple means for evaluating the chessboard situation. It merely uses the value of the captured piece, if any. If you want the program to play a smart game, a better method of evaluating the chessboard situation would be needed.

In an assembly language chess program, the evaluation subroutine might generate all of its opponent's possible replying moves in turn, and evaluate each of those chessboard situations. This could even be extended for several moves in advance. But BASIC just isn't fast enough to do this in an across-the-board game.

One possible modification to the evaluation subroutine would be to use the WHITE KING IN CHECK? subroutine. If a trial move resulted in the White king being in check, a value could be assigned to that trial move. I don't know what the value would be. This could be an experiment for using both a Black version and a White version of the program in the computer at the same time, playing one against the other.

You could arrange the opening books so that Black and White are in an equal situation when they leave the book openings. One side could have its evaluation subroutine set up so that a value would check the other side's king, while the other side wouldn't necessarily try to check. It would be interesting to see which strategy would win the most games.

Room for experimenting

Doubtless you could think up some experiments of your own. The book *Point Count Chess* by I. A. Horowitz and Geoffrey Mott-Smith is a good source of ideas. Remember, an evaluation subroutine that works well with little or no lookahead will also work well with a

several-play look-ahead. That fact alone would make this method of experimentation good for people who are trying to write their own assembly language chess programs. It would even be of use to people who are trying to improve their chess game.

Line 5500 adds a random fraction to the value assigned to the hypothetical chessboard situation brought about by a trial move. This enables the program to choose at random from among what would otherwise be equally evaluated moves.

Lines 5590 through 5640 record the lowest-valued move encountered so far. After all the trial moves have been evaluated, the move determined to be best will be the one left in the variables by lines 5610 through 5640.

Lines 5700 through 6940 contain the BLACK KING IN CHECK? subroutine. This is quite long. Any time that can be saved in this subroutine will shorten the time it takes the program to make a move, because the subroutine is used once for every trial move generated by the main routine.

The Black king's position is used as a basis. If any of the White pieces can move onto that square, the Black king is in check. For instance, lines 5800 through 6110 determine if a White queen or rook is within a rook's move of the square that the Black king is on.

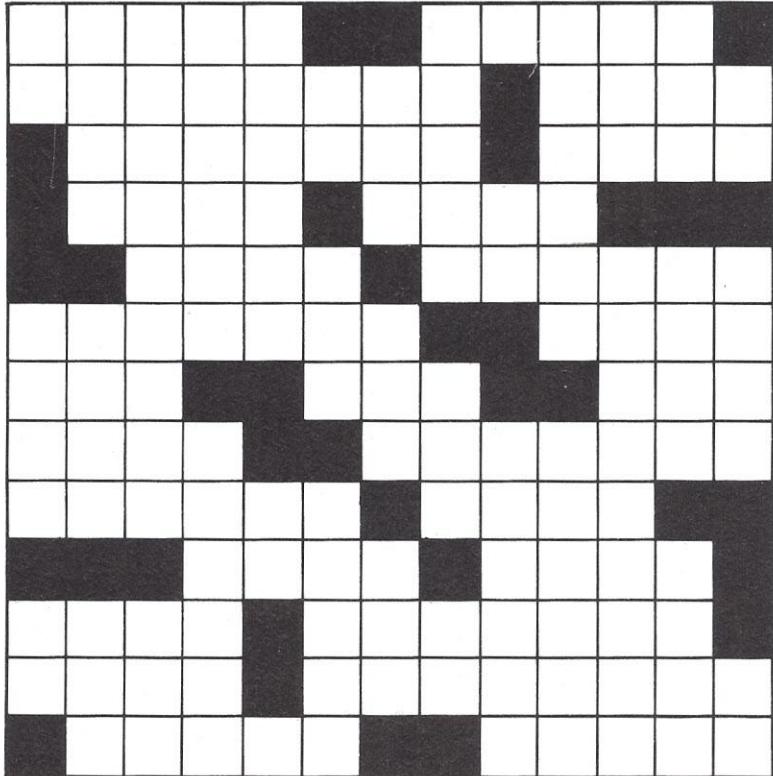
Lines 6990 through 8240 contain the WHITE KING IN CHECK? subroutine. It is very similar to the Black king subroutine.

Lines 8290 through 8680 contain the display subroutines. Radio Shack computer owners can use them as they are; owners of other computers would have to rewrite them.

Lines 8730 through 8790 contain the book openings discussed earlier.

And that is the anatomy of a chess program. *continued on page 121*

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BUSINESS COMPUTING

Lease or Buy: Which Is Best?

Analysis program helps you make the least costly decision painlessly

If you are in business for yourself, sooner or later you will decide between leasing or buying office space, a computer, a car or a duplicating machine. Will you make the right decision?

The Federal Department of Commerce has estimated that businesses in the United States spend over \$15 billion on annual lease payments, and yet a recent study by the National Association of Accountants found that the usual approach to making a lease/buy decision was neither formalized nor structured. Without such a procedure, you can't really be sure of your decision.

A computer program, Lease-Buy Analysis, can't make the right deci-

sion for you, but it can increase your chances of success by giving you a structured approach to this important decision. In addition, the program will save you hours of calculations in determining the most economical alternative.

Advantages to leasing

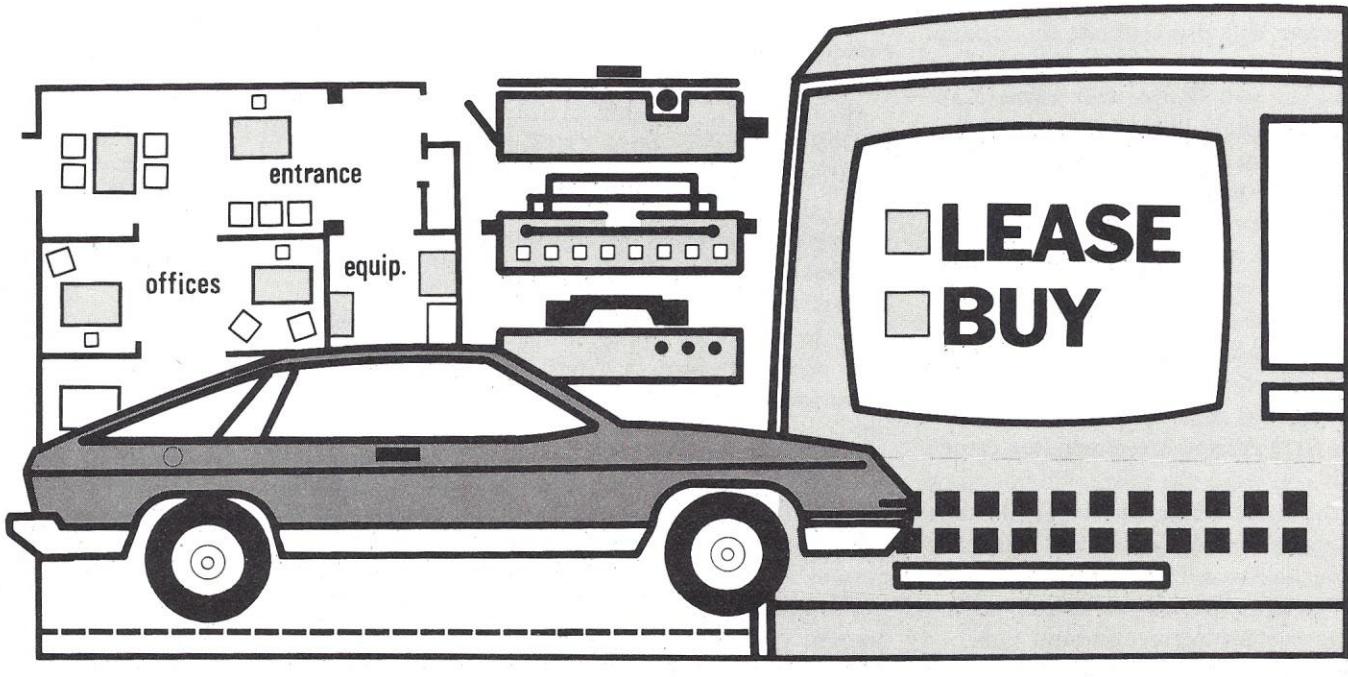
It is important to understand why more and more businesses are entering into lease contracts. First, leasing frees capital funds for the acquisition of other business assets. It is an alternative to tapping other sources of funds, such as borrowing or selling stock. Leasing gives a business owner a complete financing program. The lessee need only be

concerned with meeting monthly payments. The lessor handles the financing and spares the lessee from tying up funds.

In addition leasing allows the lessee the use of an asset without the problem of asset disposal after termination of the lease. And finally, leasing may offer lower overall cost.

It isn't all roses

Leasing has some disadvantages, too. For instance, a lessee often sacrifices control of an asset, because the lease contract may preclude alterations or even restrict the asset's use to certain geographical locations. Leasing carries a certain amount of financial risk, because



the lessee may commit himself to a specific number of lease payments, even though later he may no longer need the asset's use after a certain time. And leasing may be more costly than ownership because lease payments must be large enough to cover the lessor's depreciation and interest expense, as well as provide an acceptable profit.

Lease-Buy Analysis will help you sort through these many factors to indicate the least costly alternative. Let's try a hypothetical problem.

Buying a car

Assume that you are the owner of XYZ Company and you must decide whether to lease or buy a car that you will use constantly for your business. The car costs \$8,500 and has an economic life of three years. For tax purposes, you plan to depreciate the purchase price of the car fully over the three-year period using the sum-of-the-years-digits depreciation method, so the salvage value will be zero. Actually you expect to recover \$6,400 by selling the car at the end of its economic life. You plan to finance the car through your local bank with a three-year, 15 percent loan. You also estimate that annual operating costs will be \$200. These costs, you figure, will escalate approximately 10 percent each year.

If you lease, however, you estimate your annual operating costs will be only \$100, because the lessor has promised to provide routine maintenance. The lease payments are \$285 a month for three years.

You are in a tax bracket where the excess rate is 50 percent. If you purchase the car, you will be entitled to a 3.33 percent investment tax credit; if you lease, the lessor will not allow the investment credit to pass through to you. For this evaluation, you have decided to use a discount factor of 15 percent, because you will be paying 15 percent interest on your loan.

With Lease-Buy Analysis, all you do is enter RUN into the computer and answer questions.

Running the program

In response to ENTER NAME OF PROJECT, enter a description that uniquely identified the decision being made. You could enter XYZ COMPANY-NEW CAR. The next requests are for the date you are performing the analysis and the length of the project in years. The date should prove helpful if you need to refer to the analysis again. The project length indicates the number of years you will need the use of the asset. You need the car for three years, so simply enter 3.

The program will now ask for a discount percent expressed as a whole number. Discounting is a financial technique used to value in today's dollars the money received or spent in future years. This is necessary because a dollar invested today at 10 percent will be worth \$1.10 a year from now. Conversely \$1.10 received a year from now is worth \$1.00 today. In this case, the discount percent is 15 percent. Normally most companies use a discount factor that represents the cost of their capital.

In response to the prompt, ENTER INCOME TAX RATE AS A WHOLE NUMBER, you enter your tax bracket percentage, 50. The computer should now begin printing the first part of Lease-Buy Analysis. This is simply the information you have just entered: project name, date prepared, project length, discount factor and Federal income tax rate.

Other side of coin

The computer then requests information pertaining to the buy proposal. The first item is the total amount you must pay for the asset,

including costs (such as sales tax) associated with putting the asset into service. For our example, enter 8500.

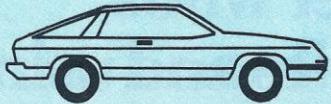
For depreciation method, the program expects one of four responses: 0 for no depreciation (used for such assets as land); 1 for the straight-line method of depreciation; 2 for sum-of-the-years-digits method; and 3 for the declining-balance method.

If you select the last method, you are asked for the declining-balance factor, and you must enter the percent of the rate you wish to use ($1\frac{1}{2}$ times the straight-line rate would be 150. Double Declining Balance would be 200). In this example, however, enter a 2 because we want to use sum-of-the-years-digits depreciation. The depreciation life of the asset is the number of years over which depreciation should be taken. Enter a 3.

Salvage value is the amount (determined at the time of acquisition) that you estimate will be realized upon sale or other disposition of the asset when it is no longer useful in your business. For the straight-line and sum-of-the-year-digits methods of depreciation, the asset value is reduced by the salvage value prior to calculating the allowed depreciation. For the declining-balance method, the full value of the asset is used in calculating the depreciation. However, the undepreciated value of the asset is not permitted to fall below the salvage value. For this example, enter a 0.

The residual value is also the amount that you estimate will be realized from the sale of the asset. Some businesses estimate salvage value to be zero, thus depreciating the full amount of the asset. The residual value, however, does not affect the amount to be depreciated and is only considered a cash inflow in the last year of the project. Since

continued on page 68



LEASE-BUY ANALYSIS

XYZ COMPANY—NEW CAR

DATE PREPARED : 6/28/80 DISCOUNT FACTOR: 15%
 PROJECT LENGTH: 3 YEARS FED. TAX RATE : 50%

BUY-PROPOSAL—ALTERNATIVE #1

PURCHASE VALUE	:	\$8,500.00	LOAN AMOUNT:	\$8,500.00
DEPRECIATION METHOD	:	S.O.Y.D.	LOAN PERIOD	: 3 YEARS
ASSET LIFE	:	3 YEARS	INTEREST RATE	: 15% ANNUAL
SALVAGE VALUE	:	\$0.00	PAYMENTS/YR	: 12
RESIDUAL VALUE	:	\$6,400.00	ESCALATION	: 10%

TAXSHIELD

YEAR	DEPREC.	INTEREST	OPER. EXP.	TOTAL EXP.	TAXSHIELD
1	4250.00	1112.86	200.00	5562.86	2781.43
2	2833.33	723.35	220.00	3776.68	1888.34
3	1416.67	271.23	242.00	1929.90	964.94
TOT	8500.00	2107.44	662.00	11269.40	5634.71

OUTFLOWS

YEAR	P & I	OPER. EXP.	TAXSHIELD	ITC & TI	OUTFLOW	D.C.F.
1	3535.80	200.00	2781.43	283.05	671.32	583.76
2	3535.80	220.00	1888.34	0.00	1867.46	1412.07
3	3535.84	242.00	964.94	3200.00	-387.10	-254.52
TOT	10607.40	662.00	5634.71	3483.05	2151.68	1741.30

LEASE-PROPOSAL—ALTERNATIVE #1

LEASE ESCALATION: 0%

EXPENSE ESCALATION: 10%

YEAR	PAYMENT	OPER. EXP.	TAXSHIELD	ITC	OUTFLOW	D.C.F.
1	3420.00	100.00	1760.00	0.00	1760.00	1530.43
2	3420.00	110.00	1765.00	0.00	1765.00	1334.59
3	3420.00	121.00	1770.50	0.00	1770.50	1164.13
TOT	10260.00	331.00	5295.50	0.00	5295.50	4029.16

BUY DCF : \$1,741.30

LEASE DCF : \$4,029.16

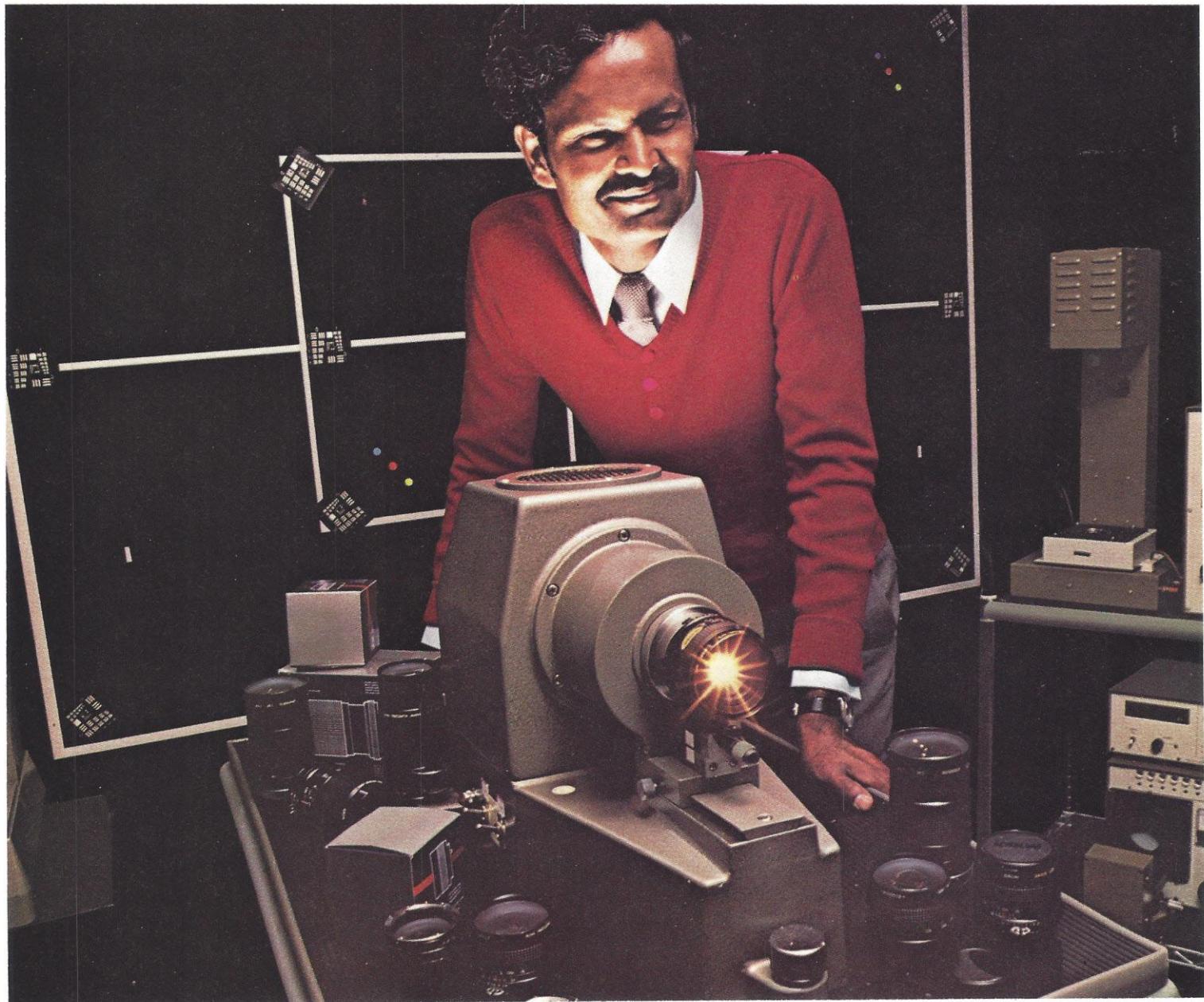
CONCLUSION—BUY IS BETTER THAN LEASE

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CIRCLE NO. 38 FOR MORE INFORMATION

CIRCLE NO. 105 FOR SPECIAL OEM INFORMATION

you expect to sell the car for \$6,400 after three years, enter 6400.

The financing analyzed

The computer now asks if the length of the financing period is the length, in years, of the project. If the financing period is the same as the project length, enter Y for yes. If the financing period is different from the project period, enter N, and you will be asked for the number of years over which this asset will be financed. For example, enter Y in response to the initial question.

The program checks to determine if the amount of the asset you will finance is the same as its purchase value. If it is, enter Y for yes. If the amount to be financed is different from the purchase price, enter N and the program will further request the amount of the loan. For the example, enter Y in response to the initial question.

Next, enter as a whole number the annual interest rate for the loan used to finance the project. Enter 15. Then enter the number of loan payments that must be made each year. For the example, payments will be made monthly, so enter 12.

Allowing for expenses

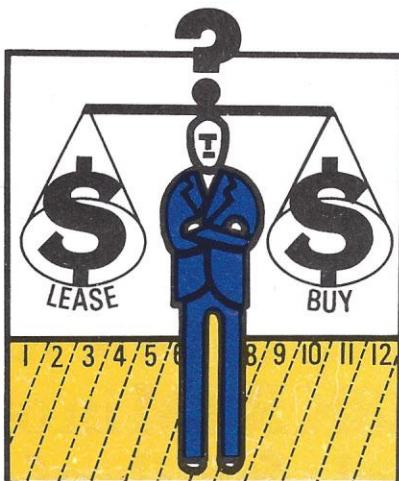
Most assets require periodic expenditures throughout the year to allow for continuous use. These are referred to as operating expenses and include such items as routine maintenance. Some assets do not have any operating expenses. If the asset you are considering does not have any operating expenses, as in the example, enter Y and then an escalation rate as a whole number. The escalation rate is the inflation rate associated with a specific expense. Since the escalation rate for the operating expenses was estimated at 10 percent, enter 10.

In response to ENTER YEAR, EXPENSES, enter the first year in

which you will incur operating expenses. In this example, operating expenses begin in the first year, so enter an L. Next, enter a comma, followed by the annual amount of anticipated expenses, \$200.

The program assumes operating expenses occur each year for the duration of the project. If, however, you expect the operating expenses to change in any of the project's years because of inflation, you may enter both the year in which the amount changes and the new amount of operating expenses.

For example, if you anticipate



that operating expenses will change from \$200 in the first year to \$250 in the third year, you would enter 3,250 in response to the prompt. If the amount of operating expenses is the same in each project year, as in the example, there will be no change, so enter 0,0.

Tax credit included

In response to the question concerning the investment tax credit, indicate whether you wish to enter the credit as a rate (by entering R), or an amount (by entering A). If the asset's purchase does not entitle you to an investment tax credit, enter 0.

If you wish to enter the investment tax credit as an amount, enter A and

then the amount. For instance if the asset you plan to purchase is worth \$1,000 and you are entitled to a 10 percent credit, as in the example, enter R and then 3.33 in response to the program prompt.

The computer now begins printing the Buy-Proposal Alternative 1 portion of Lease-Buy Analysis. The buy proposal is divided into three parts.

The first part prints out the information you have just entered: purchase value, depreciation method, asset life, salvage value, residual value, loan amount, loan period, interest rate, payments per year and escalation rate.

The second part displays the result of the tax shield calculation. The tax shield represents the amount that your taxes will be reduced as a result of incurring tax-deductible expenses. Expenses associated with a purchased asset that may be deducted from your income are depreciation, interest and operating expenses. These expenses are totaled and then multiplied by your Federal tax rate to arrive at the annual amount of tax savings, or tax shield.

The third part of the buy proposal calculates the annual discounted cash outflows associated with buying the asset. In the final analysis the financial decision to buy or lease an asset will be based on which alternative produces the least requirement for cash in today's dollars.

Items considered in the cash outflow calculation are principal and interest payments, operating expenses, tax shield, investment tax credit and terminal inflows. Principal and interest payments, as well as the operating expenses, are considered outflows.

A tax shield, that represents tax savings, because it reduces the amount of tax that you will have to pay, is considered an inflow. The program printout column labeled "ITC & TI" represents investment

tax credit and terminal inflows. In the first year of the project, only the investment tax credit to which you are entitled, if any, appears in this column. Terminal inflows result from two occurrences: (1) The sale of the asset at the end of the project for its residual value, and (2) The income tax effect (ordinary gain or loss) experienced from selling the asset for an amount differing from the asset's net book value.

The example shows a terminal inflow in the last year of the project of \$3,200. This results from the \$6,400 inflow from selling the car and a \$3,200 outflow from paying taxes on the gain when its net value is zero.

A chance for alterations

After Buy-Proposal Alternative 1 has finished printing, the computer asks if an analysis is desired. At this time you may change one or more of your answers to the previous questions by entering a Y. The computer responds by asking for the numbers of the questions you want to alter.

Assume you wish to determine what the impact will be on the buy proposal's discounted cash flow if you are unable to sell the car at the termination of the project; this would make the asset's residual value zero. Question 5 deals with residual value, so enter .5 for the question number. When the computer asks for another question number, enter zero. The computer then presents Question 5, which you respond to by entering the new residual value of zero, and the computer prints Buy-Proposal Alternative 2. If you do not wish to perform a what-if analysis, enter an N, and the computer begins asking questions about the lease proposal.

The first question here deals with the amount of the lease payments for the first year. In this example, enter 3420. If the lease contract specifies that the monthly payment is subject

to an annual increase to offset inflation, enter the amount of the annual increase as a percent. For example, if lease payments are subject to an annual 3 percent increase, enter 3. In this optimistic example, enter 0.

The lease payments entered in the initial question of this part of the program are assumed to occur each year for the duration of the project. If, however, the amount of annual lease payments changes because of inflation in any subsequent years, you may enter the year in which the amount changes and the new amount of annual lease payments.



Assume you wish to determine what the impact will be on the buy proposal's discounted cash flow if you are unable to sell at the termination of the project. This would make the asset's residual value zero.



If your annual lease payments changed from \$3,420 in the first year to \$3,600 in the third year; you would enter 3,600 in response to the program's question about changes in lease payments. If the amount of annual lease payments is the same in each project year, such as in the example, enter 0,0.

Operating expenses

Some lease arrangements indicate that the lessor will provide all services related to keeping an asset in operation. This type of arrangement is a full-service lease. If your lease is a full-service lease, or if there are no operating expenses associated with

the leased asset, enter N when asked if there are any lessee paid operating expenses.

If, on the other hand, there are operating expenses you must pay, as in the example, enter Y and then input the escalating rate, or inflation rate associated with the expense. In the example, enter 10.

In response to ENTER YEAR, EXPENSES?, enter the first year in which you incur operating expenses. In the example, input 1. Next, enter a comma, followed by the annual amount of anticipated expenses. With annual operating expenses of \$100 in the example, the complete response to this question should be 1,100.

The operating expenses entered in the previous question are assumed to occur each year for the duration of the project. If, however, these expenses change because of inflation in any of the project's years, you may enter the year in which the amount changes and the new amount. For example, if the operating expenses changed from \$100 in the first year to \$150 in the third year, you would enter 3,150. If the expenses are the same each year, input 0,0.

If the leased asset qualifies for an investment tax credit and the lessor allows the investment tax credit to flow through to you, enter the amount of the credit to which you will be entitled. Say the lessor is eligible for a 3.33 percent credit on a purchase price of \$8,500 and he allows the \$283.05 credit to flow through to you: you enter 283.05. If, on the other hand, the lessor does not allow the investment tax credit to flow through to you, input 0.

After you answer Question 3, the computer begins printing Lease-Proposal Alternative 1. The first information printed is the escalation rates for the lease payments and operating expenses. Next come the outflows for the lease proposal, consist-

ing of the lease payment, operating expenses, tax shield and investment tax credit. As in the buy proposal, the tax shield and investment tax credit are actually cash inflows.

Also note that for the lease proposal, only the lease payments and operating expenses are deductible from income. As a result, these two expenditures should be totaled and multiplied by your Federal tax rate to determine the amount of the tax shield.

The conclusion

After Lease-Proposal Alternative 1 has finished printing, the computer asks if a what-if analysis is desired. This is performed for the lease in the same way that it was for the buy proposal. The computer then prints the total discounted cash flows (DCFS)

for the last alternatives of the buy and lease proposals. And finally you receive a conclusion as to which proposal is the least costly.

After the computer has finished printing the results of the analysis, it will ask you whether you want to process another case. If you do, enter Y; otherwise input N, and the program terminates. Should you wish to add or delete any input questions, you will find the questions in the following sections of code: general inputs, lines 3170 through 3270; buy inputs, lines 3280 through 3830; and lease inputs, lines 3840 through 4150. Because each input routine is performed with a GOSUB, remember that a RETURN must be executed after the audit.

In deleting an input question, delete the line number of the first

line of code for that question, using one of the following GOSUB statements: general inputs, line 400; buy inputs, line 600; and lease inputs, line 2460.

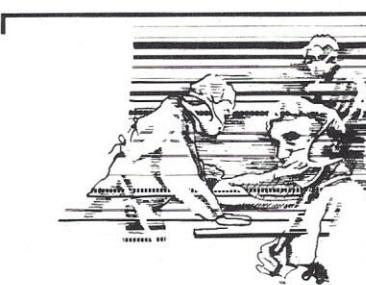
You will also have to delete the question number for a question from the DATA statement at the end of the program (line 4160). The DATA statement is divided into three sections, each beginning with a negative number and ending with a zero. The negative numbers at the beginning of each section refer to: General Questions (-1), Buy Questions (-2) and Lease Question (-3). Following the negative numbers are the question numbers corresponding to each question's first line number as it appears in the appropriate GOSUB statement.

continued on page 124

Why Do Professionals Prefer

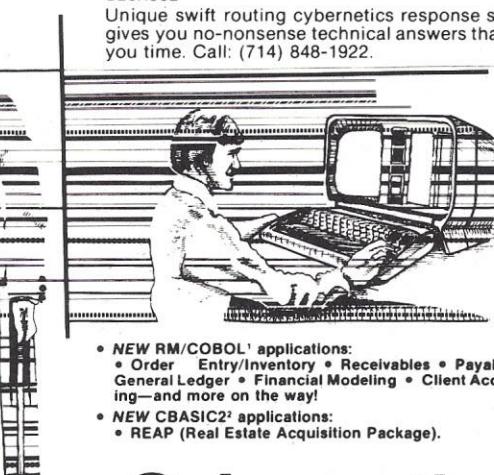
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Microcomputers and Educators: Partners in Innovation

What can and what cannot be accomplished with a microcomputer? This has been the question under study at the Ortonville, Minnesota School District for the last two years. An applied research project at the combined elementary-secondary school is exploring microcomputer applications in administration, student management and instruction. From the initial planning stages the project has had active support and participation from students, teachers, administrators, the project director, and the secretarial staff. The aim of this grassroots involvement is to produce materials that will be truly usable by school personnel. The underlying belief is that if microcomputers can accommodate local needs, they have a much better chance of being accepted by educators at all levels.

During the first year of the project, field testing was done with various brands of micros. Apple, Pet, Radio Shack, Ohio Scientific, DEC, and Tektronix units were reviewed for hardware features, software flexibility, documentation, breakdown problems and appropriate areas of application.

What to look for

No particular unit stands out as the only choice for educators, however, some generalizations can be drawn from this work. Before purchasing hardware, prospective buyers should first experience some "hands on" time with systems they

are considering. The micro should operate smoothly and perform in the manner described in the accompanying documentation. Secondly, and perhaps more importantly, one should find out where the service center for a particular system is located. Check with other users to see if the service has been good and what the turn-around time has been, especially in rural areas. Turn around time can be critical to the in-



structional and administrative cycles.

Thirdly, the computer needs software before the system can become a functional tool for instructional or administrative applications. Prospective buyers should be careful to make sure that there is an available library of software to run on their micro, or they must be willing to spend time and money in developing their own. And consideration must be given to expensive capabilities, not only in terms of memory and

peripherals, but also to special educational applications such as speech synthesizers, graphics tablets, game paddles and others yet to be developed.

The Ortonville staff found that most system problems occurred during cassette or disk loading. Volume control settings on tape recorders for some micros tended to be too critical, but with patience this was generally overcome. Recorder problems were almost always solved by cleaning and demagnetizing the heads or resetting the volume. Head alignment on a few tape recorders presented a problem, but switching recorders was an easy solution. Static electricity can be devastating and it was necessary that everyone learn how to properly discharge themselves before handling the equipment. Most other problems were overcome by opening the system and pressing on the integrated circuit chips to make sure all were properly seated. Caution: Make sure the system is turned off and the person has discharged static electricity before attempting this fix.

Software development

Microcomputers in education are so new that the hardware is running well ahead of software development. A few publishing houses offer software packages, but these are mass produced materials aimed at a wide-ranging market. Some of the commercial instructional software reviewed at Ortonville has been of questionable educational value. How can one provide for teacher in-

put to meet local educational needs? Many educators believe the development costs for locally produced software are prohibitively high, requiring highly trained professional programmers.

At Ortonville, talented students who have completed computer programming courses write programs designed to meet the expressed needs of local staff. This cost-effective approach for the school benefits both the students, who gain experience in writing original programs that are actually put into use, and the staff, who get software geared to their needs. Some programs have been developed from scratch, while others are modifications of programs obtained from other schools and the MECC (Minnesota Educational Computing Consortium) timesharing system. Student programmers have been able to modify instruc-

tional coursework for about \$10/program. An original fifteen minute lesson for elementary students about colors was developed for less than \$20 by a student consulting with a teacher. These localized materials will be used more often by the teachers, thus improving their cost effectiveness.

It becomes apparent that as teachers and students gain experience in using computers, they request more sophisticated programming. By continuing to operate this cost-effective model for software development, innovative materials should be produced as needed.

Instruction

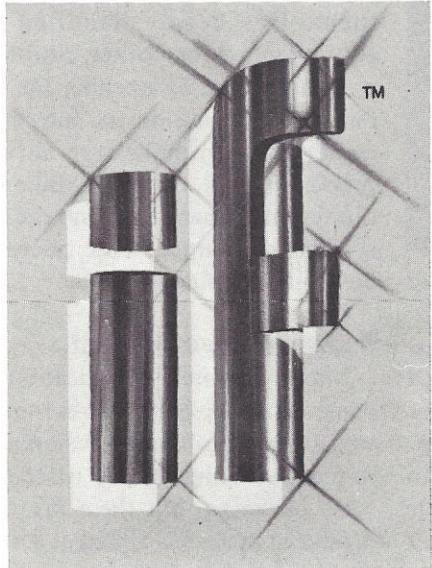
During the project's first year, over 200 instructional programs were modified or written for classroom use. Most of these were developed using the teacher/student pro-

grammer model. Subject areas included: agriculture, auto mechanics, biology, foreign languages, geography, language arts, math, music, science and social studies for grade levels from K-12. Software has been written for the Apple II, Pet, and TRS-80 microcomputers.

It's no secret that many teachers are reluctant to get involved with microcomputers. Experienced teachers have seen a variety of educational techniques and materials that failed to live up to their promises. Microcomputer enthusiasts should therefore expect a certain amount of skepticism and reluctance on the part of the teaching staff. Knowing this, the Ortonville project staff has been careful to *never* use technical jargon when discussing microcomputers with teachers and to give the teachers *exactly* what they requested in the software produced. This al-

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lows microcomputer-delivered instruction to adapt to the teacher's style, instead of the other way around. As expected, the Ortonville teachers have become more enthused about the use of microcomputers and they have supplied many creative ideas for new programs.

Effects on kids

Another project concern is the amount of time students can effectively interact with the computer. Observations indicate that users become saturated fairly rapidly in the intense activity of computer-assisted instruction. Teachers report that drill and practice programs have diminishing returns after about twenty minutes of use. Simulations and other more sophisticated programming can hold student interest for longer periods of time. After peaking in their attention, the stu-

dents begin to dawdle and some even try to "crash" the program. Teachers using micros need to be aware of the machines' limitations as well as their strengths and plan activities accordingly.

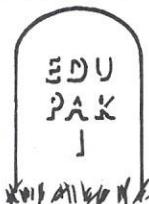
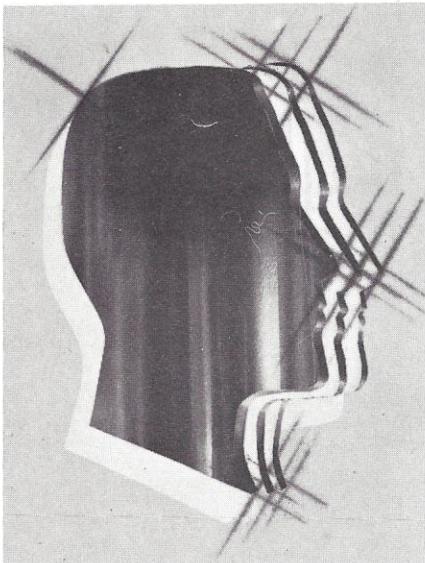
Ortonville had been using the MECC timesharing computer system before introducing microcomputers into the school. In the 1977-78 school year, before the project began, 848 hours were logged on the timesharing system. In 1978-79, the first year of the project, this figure was reduced to 341 hours with in-house microcomputers. One MECC port is now sufficient for the school instead of two. This saves \$1100/year immediately plus a savings in telecommunications costs. Reducing the use of the timesharing system for instruction allows more utilization of the network for other purposes. The access to the Min-

nesota Occupation Information System, which has a large data base, through the timeshare port went from 69 hours in 1978-79, to 153 hours in 1979-80. So it seems that using microcomputers in conjunction with access to a large timeshare network expands capabilities and makes both more efficient.

Administration

These programs are being written for the Apple II microcomputer with dual disk drives and a printer (total cost about \$4000). The secretaries and bookkeeper have worked closely with the project programmers to produce software payroll, financial reports, inventory, attendance, and student scheduling/grade reporting applications. According to the Ortonville clerical staff, the district saved \$10,000 in the first year of the project using these programs. 

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The essence of successful stock market transactions can be distilled into one word: Timing. Knowing when to buy and when to sell can dictate a prince-or-pauper status.

This knowledge of timing can be gained from a computer through the method known as moving averages. Since you want to buy stock at a major low and sell at a major high, you always need to know where the price is in its journey from a bottom to a top and its return to a new bottom.

To do this, you must be able to identify a price midpoint and two extremes. If a price is in its upward surge, you must identify where and when it made its last low and where its midpoint should occur. Is it approaching, or has it already passed? The answer to this question will remove a great deal of the conjecture from your market speculations.

Limitations and difficulties

The method presented here is one that attempts to predict when a stock price will turn. It is designed to assist people in making their own decisions in connection with the purchase and sale of securities.

But there's no magic in these methods. Any results which may

have occurred in the past may not recur in the future. It is always possible that some unforeseen factor or event may be operating which would render a stock worthless.

The how-to

J. M. Hurst's *The Profit Magic of Stock Transaction Timing* reveals the following tools for calling stock price turns with moving averages:

- envelope construction (graphic analysis);
- the twelve market and individual stock cycles;
- the use of two centered moving averages to identify the midpoints of price moves.

Envelope construction is a simple graphic technique that requires no mathematics. Simply draw a graph (See Chart 1), called a curvilinear channel, that is vertically equal at all time points and encompasses the price movements.

Start by drawing a line which generally follows the contour of the bottoms of the price moves which occur about 13 to 26 weeks apart (Chart 1). Then draw a line that parallels this line across the tops of the price moves. This produces an envelope around the stock prices that encompasses nearly all the price action. It reveals the undulations of

the prices from envelope boundary to envelope boundary.

You now have a graphic picture of the extremes of price action for the stock you are analyzing. Now draw a center line through the middle of this curvilinear channel. This line will reveal the midpoint of the price move associated with whatever cycle is dominant and fluctuating from boundary to boundary.

The 12 major market cycles

75% of the price action is due to fundamental conditions; 23% is due to cycles; 2% is due to random inexplicable factors. Research further provides evidence of at least 12 cycles with nominal durations of 18, 9, 4½, and 3 years; 18, 12, 9, 6 and 3 months; 6½, 3¼ and 1½ weeks. Hurst points out that often the six- and three-month cycles show up

combined as an 18-week cycle.

Centered moving averages

Finding the midpoint of the price movement is accomplished by the use of two moving averages, one with a span equal to the period of the dominant cycle and the other with a span equal to half this time. The term "span" refers to the number of weeks over which the average is formed. We will refer to the moving average that matches the dominant cycle as full span, and the one equal to half the cyclic period as half-span.

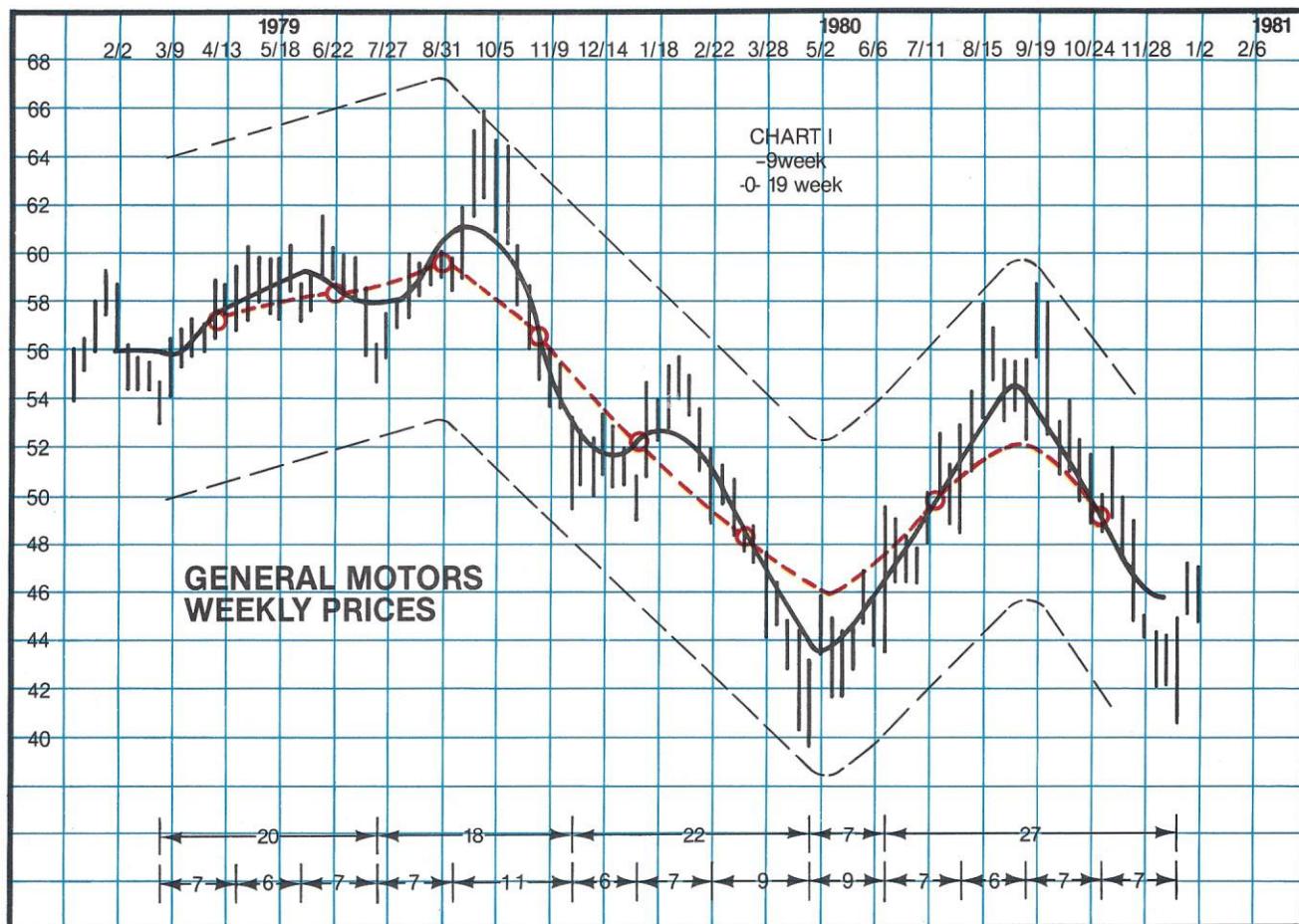
A moving average should be centered at the middle of the time period over which the average was formed. If the span used is nine weeks then the average should be plotted five weeks back. Hurst has worked out a method using the full-span and half-span averages to iden-

tify the midpoints of moves of the dominant cycle.

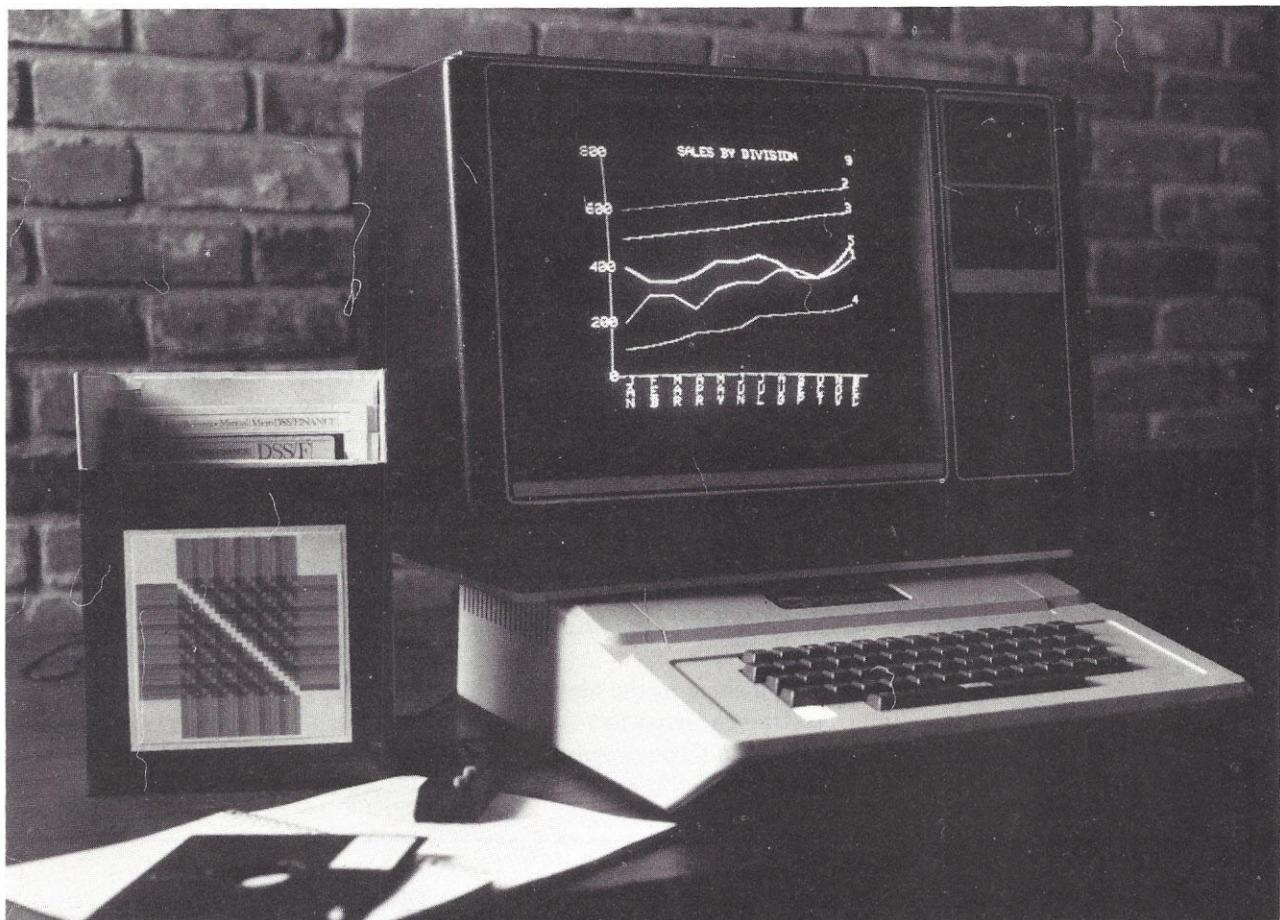
A moving average is calculated over a time series by summing a number of data points equal to the span and dividing the sum by the span. In a series of nine weekly data points using a span of five weeks for the average, the first five items would then be plotted consonant with the third week. Next, the first item would be dropped and the sixth item picked up. A new sum of items—two through six—would be obtained and the sum again divided by five. This average would be plotted at the fourth week. The process would be continued until the ninth item was added.

Analysis of prices

The weekly high and low prices of General Motors have been chosen to



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illustrate the process of analyzing stock-price action. Tables 1 and 2 contain the weekly highs, lows and midpoints for 1979 and 1980 respectively. These data are plotted in Chart 1 along with several other items. Vertically equidistant envelopes and two properly lagged moving averages with the prices have been drawn. The data and the averages are current to the last Friday in 1980.

To bring the data up to date, gather the subsequent highs and lows and plot them to continue the analysis. Notice in Tables 1 and 2 that integers such as 561 are presented for the first week high in 1979. The price $56\frac{1}{8}$ has been converted to 56.1 and multiplied by 10. Eights were rounded to decimals as follows: $\frac{1}{8} = .1$; $\frac{1}{4} = .2$; $\frac{3}{8} = .4$; $\frac{1}{2} = .5$; $\frac{5}{8} = .6$; $\frac{3}{4} = .8$; $\frac{7}{8} = .9$. Converting to integers saves having to input data with a decimal point each time.

Chart 1 also contains marked-off points of nominal 6 $\frac{1}{2}$ and 18 week cycle bottoms. By projecting these into the future a time can be found when these cycles are turning simultaneously. At such times sharp moves in the direction of the turn can be expected since these cycles each add their combined price "strength" in phase with each other.

The Steps

- Obtain weekly high and low prices for your stock for at least two years. Back issues of Barron's Magazine at your library will be a help.
- Calculate the midpoints of these prices. Just add the high and low and divide by two. Round off to an integer.
- Plot a chart of the highs and lows for the entire period.
- Sketch in a rough envelope across the highs and lows. See Chart 1 as
- an example of how it should look.
- Mark off distinct bottom points that touch or approach the bottom envelope. These should occur anywhere from six to 24 weeks apart. (See March, July, November 1979, January, April and December 1980 in Chart 1.)
- Eliminate any "mavericks" that are short or long (See Chart 1, April, December 1980).
- Average the remainder. This will be the current periodicity of a nominal cycle that is either 13, 18, or 26 weeks according to Hurst's model.
- Calculate a full span moving average for this cycle. Use an odd number. If it averages 20 weeks, for instance, use 19 as your span. Use the midpoint prices as your data.
- Calculate a half span moving average of the identified cycle. Again be sure to use an odd

TABLE 1 GENERAL MOTORS 1979							
WEEK	HIGH	LOW	MDPT	WEEK	HIGH	LOW	MDPT
1	561	541	551	27	600	579	590
2	565	552	559	28	586	558	572
3	581	560	571	29	564	549	557
4	594	575	585	30	576	558	567
5	589	562	576	31	580	570	575
6	562	545	554	32	601	574	588
7	558	544	551	33	596	585	591
8	556	545	551	34	596	588	592
9	548	531	540	35	601	590	596
10	565	541	553	36	599	584	592
11	571	554	563	37	620	589	605
12	574	558	566	38	652	615	634
13	572	561	567	39	659	624	642
14	590	564	577	40	649	610	630
15	588	574	581	41	648	604	626
16	596	569	583	42	605	581	593
17	604	572	588	43	588	561	575
18	600	581	591	44	568	548	558
19	600	574	578	45	564	535	550
20	600	570	585	46	554	535	545
21	604	584	594	47	534	494	514
22	589	572	581	48	529	504	517
23	594	576	585	49	525	501	513
24	618	591	605	50	534	508	521
25	605	591	598	51	530	505	518
26	601	584	593	52	521	505	513

TABLE 2 GENERAL MOTORS 1980							
WEEK	HIGH	LOW	MDPT	WEEK	HIGH	LOW	MDPT
1	510	491	501	27	480	464	472
2	549	508	529	28	502	480	491
3	540	523	532	29	528	500	514
4	554	530	542	30	514	489	502
5	558	540	549	31	530	486	508
6	550	534	542	32	545	511	528
7	536	510	523	33	579	534	557
8	520	489	505	34	571	548	560
9	514	498	506	35	555	531	543
10	509	484	497	36	556	534	545
11	489	478	484	37	558	522	540
12	489	472	481	38	589	556	573
13	478	440	459	39	581	524	553
14	565	446	456	40	532	510	521
15	449	428	439	41	541	511	526
16	445	402	424	42	524	498	511
17	432	395	414	43	518	489	504
18	458	434	446	44	502	485	494
19	452	415	434	45	520	490	505
20	446	416	431	46	499	475	487
21	466	428	447	47	490	448	469
22	468	446	457	48	451	441	446
23	456	438	447	49	444	421	433
24	495	434	465	50	442	420	431
25	492	464	478	51	451	404	428
26	485	464	475	52	472	450	461

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6656

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500 kilobits/sec

Latency (avg.)

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83 ms

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Average

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Time

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number. If the full span is 19, use 9 as a half span. You need not worry about exactness in choosing the span since the line that is plotted for a nine-week or a ten-week span

does not vary enough to affect projection. (Use the program to test this point if you like, using two consecutive odd number spans.)

- Plot the full- and half-span

Program Listing

```

10 'SIMPLE MOVING AVERAGE PROGRAM
20 'BY EDWARD SHAFER
30 '10348 DANIEL WAY
40 'RANCHO CORDOVA, CALIF.
50 ' JANUARY 1981
60 A$="WEEK MIDPOINT AVERAGE"
70 B$="##### ##### ##### "
80 INPUT"NUMBER OF VALUES":N
90 DIM A(N),X(N)
100 INPUT"ENTER NAME OF COMPANY":N$
110 INPUT"ENTER YEAR(S)":Y$
120 FOR I=1 TO N
130 PRINT"ENTER VALUE":I
140 INPUT A(I)
150 NEXT
160 INPUT "ENTER SPAN":S
165 Q=S
166 FOR I=1 TO N:X(I)=0:NEXT
170 K=1:Z=(S+1)/2
180 T=0
190 FOR I=K TO S
200 T=T+A(I)
210 NEXT
220 X(Z)=INT(T/S+.5)
230 K=K+1:Q=Q+1:Z=Z+1
240 IF Q>N1 THEN 180
245 GOSUB 350
250 LPRINT CHR$(30)N$,Y$
260 LPRINTCHR$(15)A$CHR$(14)
270 FOR I=1 TO N
280 LPRINT USING B$; I,A(I),X(I)
290 NEXT
300 INPUT"WANT TO CONTINUE":Z$
310 IF LEFT$(Z$,1)="Y" THEN 160
320 END
330 IF NC52 THEN M=N ELSE M=52
355 L=1:C=52
360 FOR I=L TO M:PRINT I;X(I),:NEXT
370 INPUT"PRESS ENTER TO CONTINUE":Z$
380 L=L+C:M=M+C
390 IF MCN+1 THEN 360
400 INPUT"WANT HARDCOPY":Z$
410 IF LEFT$(Z$,1)="Y" THEN 420
420 GOTO 300
430 RETURN

```

averages, properly lagged, on the chart.

- Graphically sketch the continuation of these lines up to the current price entries using the direction of the price movement since the last plots of the averages indicate their directions.
- Notice the relationship of your full-span moving average to the sketched envelope. It should run roughly down the middle of the envelope.
- Erase the old envelope and create a new one equidistant above and below the plotted full-span average which encompasses most of the price action. This is a more accurate envelope which can be relied on to indicate future turning points of the dominant cycle you've isolated. Notice in Chart 1 how the prices bounce off this envelope. For General Motors,

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CIRCLE 44

TABLE 3

Line	Function
60-70	Establish table format and headings using strings.
80	Calls for the number of entries you will be making.
90	Dimensions two arrays, one for the data, the other for the averages.
100-110	Are table headings for company and time period.
120-150	Input the data using a FOR/NEXT loop.
160	Calls for the span to be used. One span is run at a time. The program returns here for more runs.
165	Sets a variable equal to the span.
166	Resets the array for the averages to zero during subsequent runs.
170-180	Initialize the counters. Z = the number of lagged weeks.
190-210	Sums the data.
220	Calculates the average and lags it one-half span back.
230	Advances the counter by one.
240	Checks for end of data and returns to Line 180 if not at the end.
246	Sends the program to a screen print routine to display the averages. Since there may be more than a full screen of averages to display, the program is set to stop at Line 370 so you may read 52 averages before continuing. If less than 52 averages are computed, Line 350 keeps the program from fouling up. Lines 370-390 allow subsequent averages beyond 52 to be displayed. Lines 400-410 allow you to make a hard copy by returning to Line 250 via Line 430.
250-260	Print table headings.
270-290	Print the week number, datum, and the properly lagged average for each week.
300-320	Decide whether to continue or to terminate the program.

this 12- or 13-point envelope has held firm for a long time.

- Extend the envelope from the last plot of the full-span average forward to the current price.
- Notice where the full- and half-

span averages last intersected. This was a halfway point in the price move of the dominant cycle. If it has recently occurred or is about to occur again, the current price should be approaching an

envelope boundary and you can safely invest for a move up (bottoming action) or a move down (topping action).

- If the *half span* average is currently turning, prices are now at the halfway point of their move and headed toward one of the envelope boundaries.

The moving average program

The moving average program is written in Microsoft BASIC for the TRS-80 Level II Model I computer. It enables you to enter all your data once and then to compute as many spans as you wish with the same data. The program computes a simple, uniformly weighted moving average. It sums the number of items equal to the span, divides by the span amount and saves the resulting average in an array which is lagged the proper number of weeks back. The program also allows you to print hard copies of the results if you have a printer. This code is for a Radio Shack Quickprinter (Centronics). 

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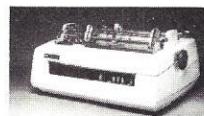
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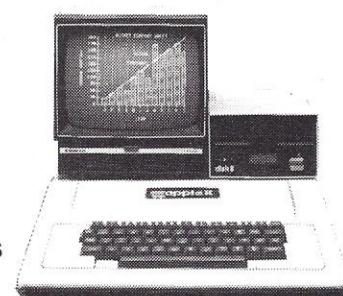
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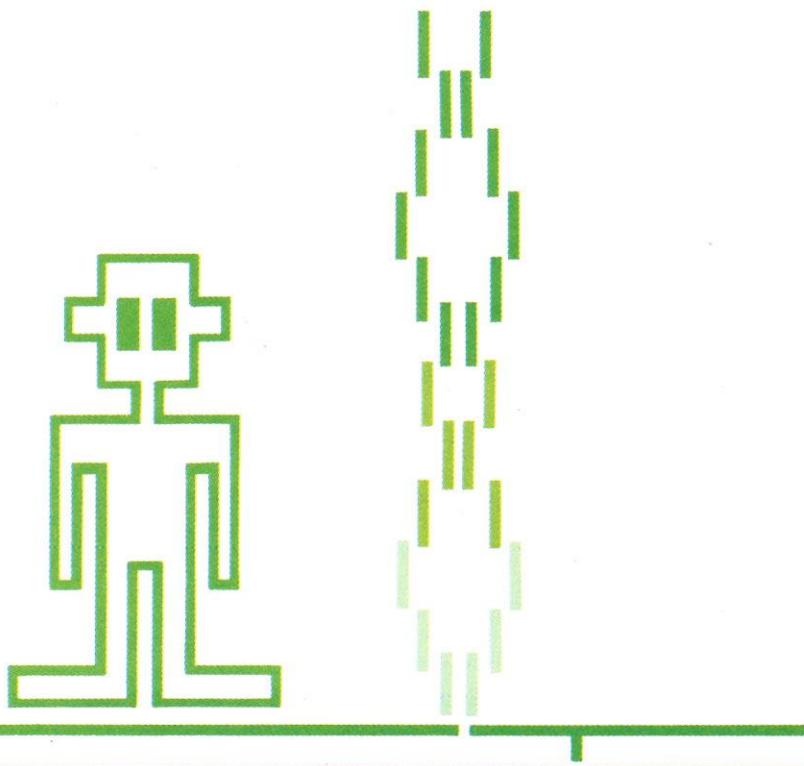
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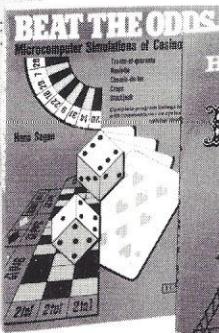
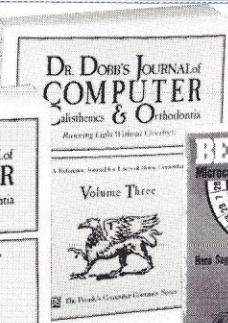
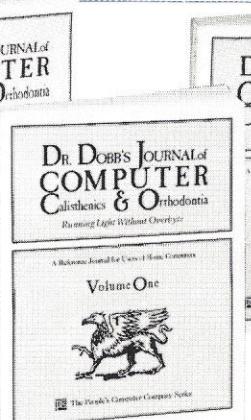
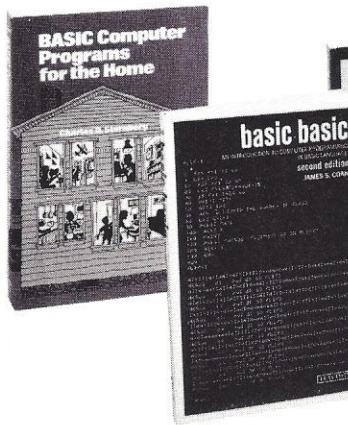
Two players compete against each other. In the play of the game, a robot attempts to cross a bridge that is a representation of that portion of

the number line between 0 and 1. Players attempt to locate explosives hidden on the bridge before the robot can cross. The location of the explosives is described as a fractional value. The computer initiates play by giving a clue (the explosives are located at $1/4$) about the location. The randomly chosen first player then moves a cursor to his guess for the correct location. If the guess is incorrect, the robot shakes

his head and moves forward a few steps, and then the next player gets to guess. If, however, the guess is correct, then the bridge blows up and the player that guessed the location is awarded points for his correct guess. The first player to 21 points wins.

All incorrect guesses remain displayed, to provide help for future tries. The computer will provide additional guidance by indicating





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whether the last guess was too far to the right or left. If the two players do not locate the explosives before the robot crosses the bridge (10 tries), then the correct location is displayed for the players to see.

Program notes

The computer prints the robot as a series of graphics characters that are stored as strings. These strings are defined in lines 20-24. The printing routine is in the subroutine in lines 20000-20210.

The fractions are generated in lines 510-538. The numerator is stored as N and the denominator as D. Lines 511 to 531 decide what the denominator will be. You can see that the denominator will be limited to certain values.

Line 535 creates the numerator. The Euclidean Algorithm is used in lines 536-538 to test the fraction, to determine if it will reduce, and it reduces it if possible.

The length of the bridge is 120 graphics locations, because 120 is the least common multiple of all available denominators. This means that all denominators can be represented by an exact position rather than a close approximation.

The reducing routine, while always presenting fractions in reduced form—which is also good mathematical form—has a side effect of weighing the fractions in favor of the smaller denominators.

The input is done by PEEKing the keyboard memory location (14400). This allows the blinking dot to move right or left as long as the appropriate arrow key is depressed. When a player moves the dot to the desired spot, he registers the guess by pressing the space bar. All other keys, except the BREAK key, are ignored.

When the left arrow is pressed, the memory location 14400 contains the value 32; line 710 looks for this value. When the right arrow is pressed, location 14400 contains a

64; line 720 checks for 64. If the space bar is depressed, 14400 will contain 128, which line 730 uses. Any other keystroke will be ignored.

To keep the blinking dot between the endpoints of the bridge, and to

avoid ruining the formatted display with an FC error by a heavy handed player who moves the dot off the screen, lines 711 and 721 set limits as to how far to the left or right the dot is allowed to move.

continued on page 127

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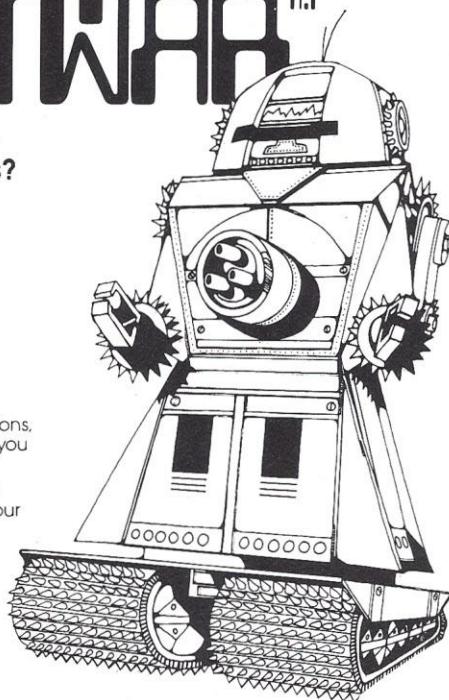
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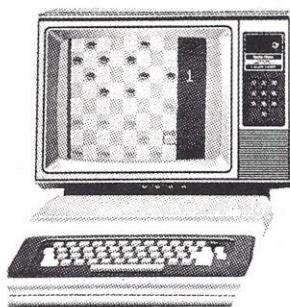
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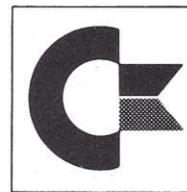
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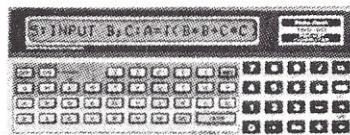
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LEISURE COMPUTING

Making Music From Micros— A Primer

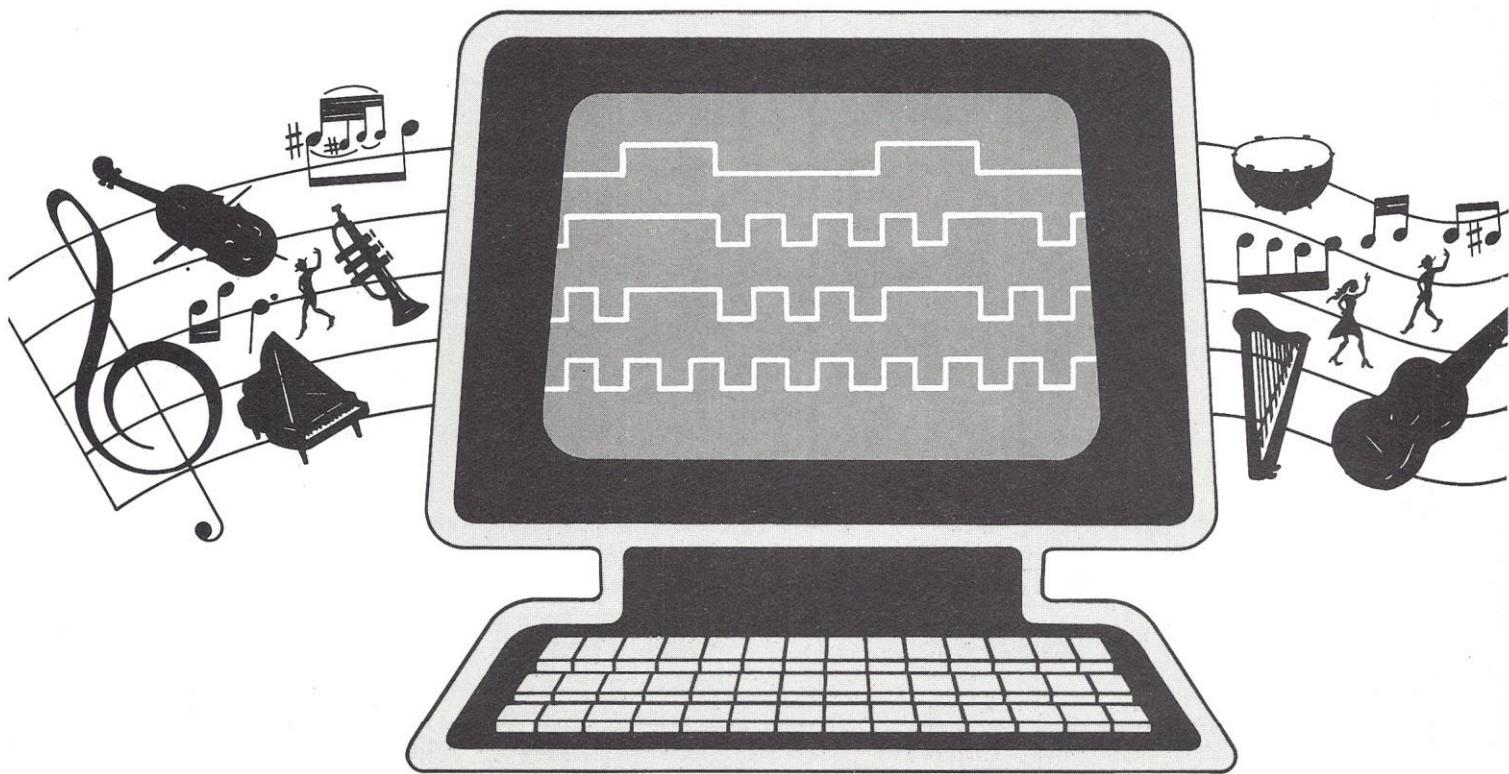
Musical terms can be just as complex as computer terms. Herewith a glossary to get you started on using the computer to provide music

Just about every personal computer on the market can be equipped—or is equipped at the time of sale—to make sounds. It's logical to think that if the machine can make noise at all, then surely it could be made to produce music.

Growing numbers of personal-computer owners want to know just how that can be done.

Unfortunately, it's not all that easy. Some who have been interested in the computer generation of music say it takes a good programmer about a year to write a program for music on a microcomputer. Nevertheless, it can be done.

Those interested in using the computer to play, and even write, music can be classified into two broad groups: those who have had musical training and experience and those who haven't. The first group, a small but growing number of musicians and composers who have experimented with computers and have mastered their application to music, are now applying untried methods to create new sounds not possible with traditional instruments and techniques. New intervals and scales, new timbres and

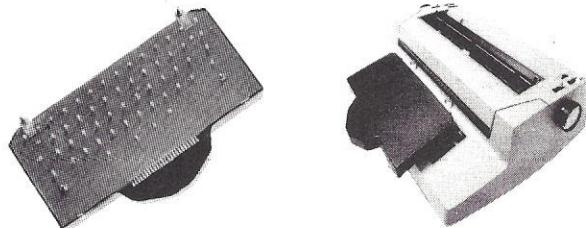


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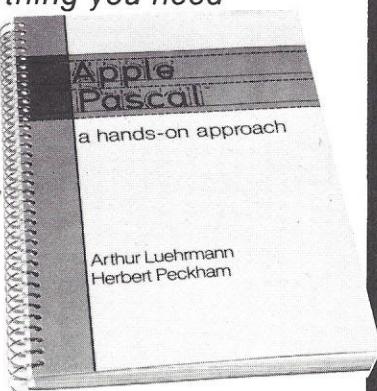
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LEISURE COMPUTING

notes higher or lower than those possible with existing instruments are available with computer-controlled, electronic synthesis of music.

But by far the largest segment of computer users bitten by the music bug is that group of non-musically trained people anxious to extract yet another benefit from their computers. The computer is there—it's been a help with the taxes, financial planning and so forth. So if the ability to create music is there, why shouldn't the computer bring to fruition a lifelong desire to play or create music?

But there's a problem. Music is a profession in its own right, and has a list of terms all its own. They might seem as confusing to the non-musical person as computer buzzwords do to the average non-computer person. There is, for example, this excerpt from an ad for an SBI synthesizer board: "The user can define attack and sustain, duration, pitch, tempo, waveform envelope and more". It's clear that after mastering the programming language, one now faces an entirely new language that must be taken on.

The glossary that follows is an attempt to help in the transition from non-musician to musician. Please note that the glossary is in alphabetical order, and is not designed to necessarily be read in that order. So some of the early definitions won't make sense until the later definitions are read. Remain undaunted—plunge in and soon the whole thing will make sense.

Additive sinewave synthesis: Read the other definitions first, and then see "Fourier analysis" and the definitions from "quantize" through "sampling rate" for further explanation. This is an extremely precise and flexible method of generating sounds with a computer, but very complex and not very economical in terms of processor time, as the entire musical sound has to be computed. That is, all the movement the loudspeaker cone will go through when it plays the music has to be completely computed in numbers. This leaves little extra processor time for other tasks. And the computer can't be interrupted during the playing of a sound without an audible "glitch". The advantage of this technique is that it requires no additional specialized hardware apart from the computer itself and a digital-to-analog converter (DAC). The Micro-music system uses additive sinewave synthesis, which is why it is of the enter-now, play-later non-interactive score entry type of music system. The Mountain Hardware music boards use this technique, too, but place the burden of the continuous computation in specialized hardware on the plug-in boards, instead of in the Apple itself. The Apple's processor is free to listen for new instructions you might want to give it from a Keyboard or through an interactive program for example, while it's playing. Unfortunately, MH's software fails to take advantage of this and is a non-realtime, non-interactive score editor; however, the Alpha Syntauri sys-

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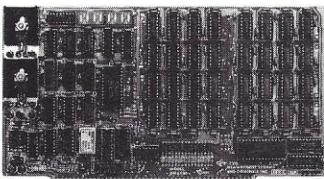
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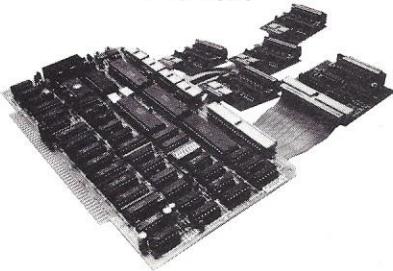
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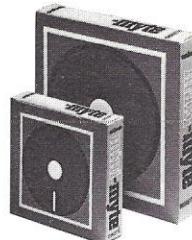
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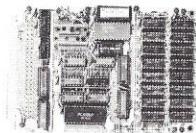
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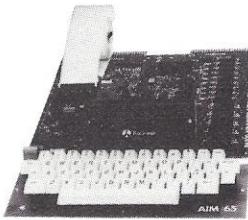


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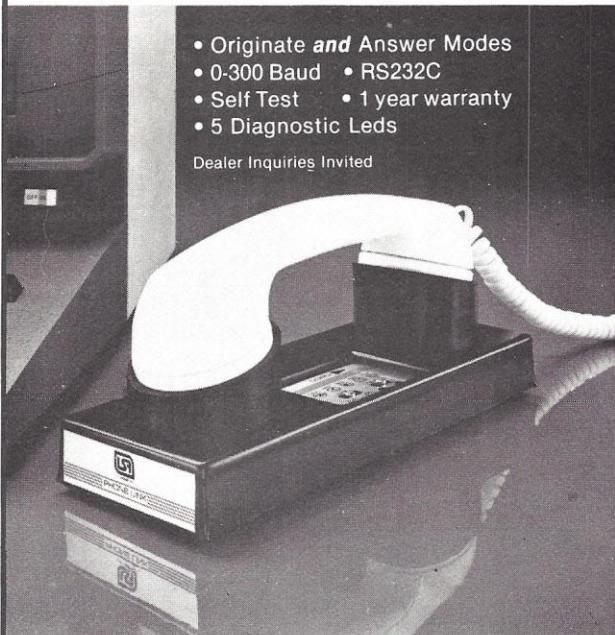
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CIRCLE 51

tem using the MH boards permits such live interaction.

ADSR: A common multi-state envelope, consisting of Attack, Decay, Sustain, and Release stages. See "envelope".

Amplitude: The intensity of a signal, perceived as the loudness, or volume, of a note, a sound, or an instant within any audible signal. This is how far the loudspeaker actually moves when it's reproducing the sounds.

Analog synthesizers: (Such as the Moog, Buchla, Arp, and others.) Music systems in which signals vary continuously (as opposed to stepwise, as digital signals do) and are controlled through relationships of proportion.

Attack: The initial stage of a sound's envelope, during which the sound is getting louder. The attack value, (or attack variable in a computer music program) is usually expressed as a rate or an increment.

Decay: The stage of a sound's envelope during which the sound is decreasing in amplitude (see Figure 1). Usually the decay is considered to be the first stage after the attack as in the ADSR envelope, or the simpler AD (or AR) envelope.

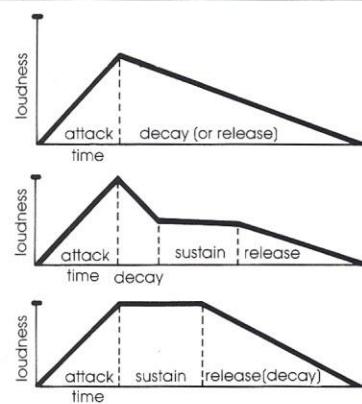


Figure 1: The stages in the play of a note.

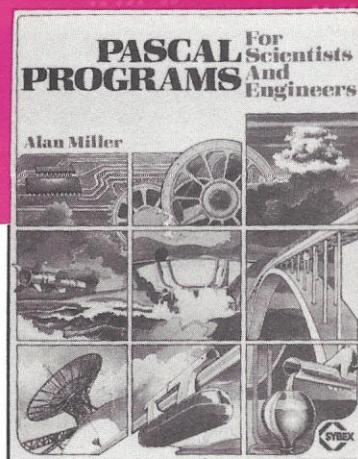
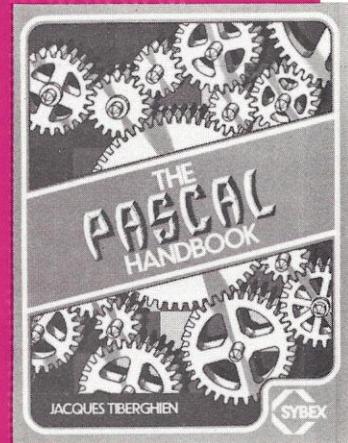
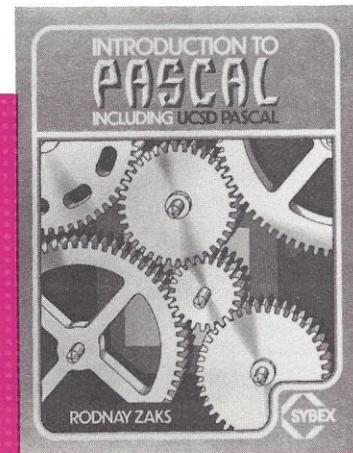
Duration: The period of time during which a sound is occurring.

Entry delay: As opposed to duration, this term is used to represent the amount of time between the beginning of one note and the beginning of the next.

Envelope: The overall shape of the amplitude of a sound over time (see Figure 1). An envelope is a curve which represents the changing loudness of a sound over its entire duration. Although envelopes are continuously varying functions, they are usually described as though they consisted of a small number of discrete stages, each of which has a constant slope.

Fourier analysis: (See "fundamental" and "harmonic.") A method of describing a complex waveform (or timbre) by breaking it down and analyzing it into a series of individual sine waves (or single-frequency com-

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CIRCLE 53

LEISURE COMPUTING

ponents), each of which may have a different amplitude and a different envelope.

Frame: In real sounds, each partial sound has a different envelope (the harmonic content of a sound changes during the sound). A "real" sound is better described, and a synthesized sound has a more natural quality, if this is taken into account. But to compute such continuously changing sounds over time is a bit beyond the realtime capability of most computers, so the sound is broken up into a sequence of static frames, much the same way a moving image is framed when it is filmed with a movie camera.

Frequency: Audible as the pitch of a musical note, frequency is the rate at which a signal oscillates.

Fundamental: When we describe the frequency of a tone, we are generally referring to the frequency of the fundamental, or lowest frequency present.

Harmonic: (or overtone) Any of the harmonically related components of a single tone which sound with (above) a fundamental frequency.

Harmonically related: Partials with frequencies which are describable by ratios of relatively small integers (1, 2, 3 to 3, etc.) are said to be harmonically related.

Hybrid synthesis: A combination of techniques, usually digital and analog sound-synthesis techniques. For example, a computer controlling an analog music synthesizer is performing hybrid synthesis.

Modular: Hybrid systems are a type of modular system. These consist of separate units, modules, each of which optimally performs a specific function.

Modulation: The process of changing some characteristic of a signal in a defined way. Usually taken to mean the imposition of a slowly varying information signal on a quickly changing carrier signal as in amplitude modulation and frequency modulation.

Noise: Sound which contains frequencies not harmonically related to each other (not describable in ratios of relatively low integers). Usually random frequencies (like radio static). Musical percussion (cymbals, drums, etc.) consists largely of noise, as opposed to tone.

Octave: The musical term for an interval consisting of an exact doubling frequency. It gets its name from the fact that there are 7 different natural notes in a typical European scale or mode, the eighth being a repetition of the first (at double the frequency).

Oscillator: Any instrument, device, or method which electronically generates tones by creating cyclic repetitive patterns (oscillations) of voltages or numbers.

Pitch: Musical term for frequency, or rate of oscillation of the audio signal. Usually quantized into discrete divisions in the European musical tradition.

Post-processing: Whatever is done to alter or refine a signal after it has been created (as opposed to the qualities originally built into when it is first generated),

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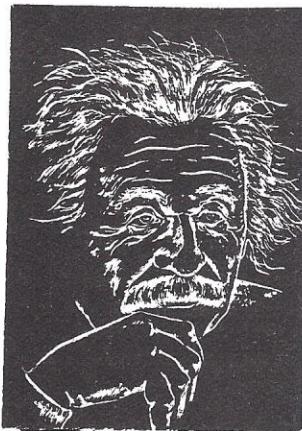
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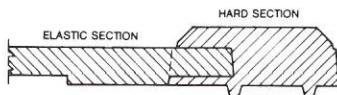
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The keyboard has been referred to as a triumph of human engineering - from the way the keys seem to have been custom designed to fit your fingers, to the way the special feature switches have been grouped. A flip of a switch (or under computer control of course) and the printer becomes a foreign language machine. Push a button, and like magic the printer automatically locates and lines up columns of figures, perfectly balanced between the margins. This incredibly fast, extraordinarily quiet electronic keyboard puts more programming power at your fingertips than printers costing five to ten times as much.

THE DISPLAY

The TYPRINTER 221 presents a new dimension in operator/machine communications. In the manual (typewriter) mode, the printer controls and verifies all entries before printing. The display exhibits the last 15 characters of the text, word-by-word, until the end of the line. The operator may control what will be printed before the actual printing takes place. This new found flexibility enables you to make modifications along the entire line and in both directions. This 20 character plasma display has the ability to scroll backwards as well as forwards; will give the operator a visual indication as to which print mode is currently being selected as well as the number of characters remaining before the right margin is reached. The display will also indicate to the operator:

The number of characters available in the memory.	What characters will be inserted into an existing text.
When the printer is in an error condition.	When the memory for the previous line has been selected.
When a pre programmed form layout has been selected.	A warning message that the end of the page is being approached.
When the printer is operating from the internal memory.	That a hyphenation decision must be made.

PRINT MODE

The TYPRINTER 221 will allow you to automatically highlight individual characters, words or complete sentences. Whatever is entered from the keyboard or from the computer, even an existing text file, can be printed in one or more of the five different modes:

- traditional printing;
- underlined characters;
- true bold characters where the horizontal component of the character is increased without disturbing the vertical component;
- characters which are both bold and underlined, and;
- a feature unique among computer printers—printing in reverse — white on black, sort of reverse video on paper.

MULTILINGUAL CAPABILITY

A unique and useful feature of the TYPRINTER 221 is its capability of being able to print in several languages without changing the daisy wheel. In addition to English, every standard daisy wheel has the ability and the necessary characters to print in French, Spanish, Italian and German.

THE FEATURES

Automatic justification of the right margin

The electronics of the TYPRINTER 221 have made right hand justification a simple, automatic operation.

Phrase and format storage

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Automatic centering

The TYPRINTER 221 will not only center any title between the pre-set margins, but will also center over one or more columns, or over any specific point and will even align copy with the right margin independent of the left margin.

Automatic vertical lines

A command from the computer enables an automatic feature which prints vertical lines at any point on the paper.

Automatic tab sequence recall

With the TYPRINTER 221 you may store and recall the most frequently needed margin and tab sequences for applications such as daily correspondence, statistical reports, etc. This guarantees consistent high quality appearance of each document.

Paragraph indent

A computer command instantly sets a temporary margin in order to print one or more indented paragraphs with respect to the right margin.

Automatic decimal point location

No matter how many figures to either the left or right of the decimal point, the TYPRINTER 221 will automatically line up the figures with the decimal point in any position you choose. Statistical printing has never been easier.

Column layout

This feature allows you to obtain automatic and perfect distribution of spaces between columns in respect to the margins. A perfect page balance is assured without the need to carry out calculations or additional operations.

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and before it has been projected to the listener.

Quantize: To reinterpret a continuously changing function as a series of discrete steps, usually to reduce the amount of information that needs to be contend with.

Resolution: The rate at which the computer takes samples of a continuous function, relative to the amount of information which is really in that function.

Sampling rate: The number of times an analog signal is sampled in a given time interval. The sampling rate necessary for sampling and reconstructing a tone is at least twice the frequency of the sampled tone.

Sawtooth wave: A common electronic music waveform, (see Figure 2) containing a full set of harmonics, which decrease in amplitude as they ascend in frequency (inversely with the square of the harmonic number). Sawtooths may sound buzzy, brassy, string-like or even very bizarre, depending on what modulation and post-processing are used.

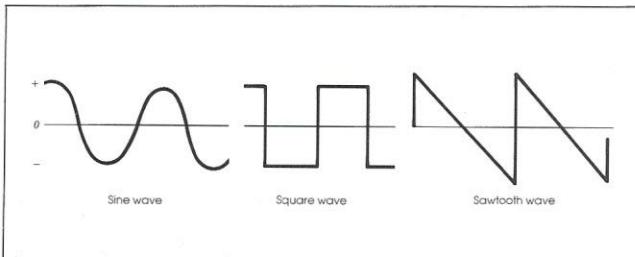


Figure 2: Common waveforms for synthesized music.

Sinewave: This waveshape (see Figure 2) is often considered to be the basic component of musical sound. Consisting of only a fundamental, a sinewave has no overtones (harmonics). Consequently, all sounds which are more complex, however rich in harmonics, can be described as a sum of some group of sinewaves (See Fourier analysis).

Squarewave: Also called a pulswave, (see Figure 2) this is the natural voice of the binary species of musical instruments. It can be created by flipping a single bit on and off.

Sustain: The stage of an envelope during which the sound maintains constant amplitude.

Timbre: Tone quality; tone color; the perceivable character of a sound, which is a function of its waveshape, or of the harmonic content of the sound.

Tone: A sound made up of periodic repetitive patterns of change, or oscillations.

Tonewheel: A technique to create a low-resolution waveform by the on-off pattern of the bits in a byte, oscillating the byte with a repeated assembly language rotation instruction. Requiring a DAC, and best used with a good lowpass filter, it can produce some interesting sounds.

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—Dhahran, Saudi Arabia

I myself have told several people that next to a disk, I consider the [A L F] synthesizer to be the most important peripheral they could purchase for their system. Very excellent job! Keep up the good work.

—Oak Ridge, Tennessee

I recently purchased 2 of your Apple music boards. Out of the peripherals I have for my Apple, I enjoy them the most. It has to be the most enjoyable thing that has ever been invented. I hope you continue to develop products as clever and enjoyable as this one. The Entry program has to be one of the most sophisticated programs I have ever seen. It proves that a hardware manufacturer DOES have the ability to also produce quality software. It is almost worth the price of the boards just for the Entry program.

—Burbank, California

About ease of use:

I have had my Music Card MC1 for a little more than a week now and I have almost completed entering "The Maple Leaf Rag". I found it to be a lot simpler than I thought and so I am very, very pleased. My family isn't because I sit up to all ends of the night playing with the blasted thing!

—Cypress, Texas

A L F has opened up my head and ears and enabled me to do things musically which I would like to be able to do on [conventional] instruments. As much as I love the instruments I try to play, I just don't have the talent and technique to play what is in my head. By golly, the A L F board doesn't know about my limitations, though. I can play hell out of that thing, playing notes and tempos which previously have existed only in my head. Many thanks from a frustrated musician and satisfied A L F "player".

—Demopolis, Alabama

About documentation:

I don't know much about hardware, but I have been a programmer for 15 years and I have never seen a better piece of software documentation than your user manual. It is a joy to study!

—Lancaster, California

About the competition:

Recently, I purchased an [A L F] 9-voice board and a couple of music albums . . . all I can say is that I wish I had listened and played with it before I purchased the Mtn. Hardware board. It sounds about the same and is vastly superior in software, ease of use, and price. The Entry program is a joy to use and it's easier than Mtn. Hardware's, but then, I guess you guys know that already. (Oh yes, you wouldn't happen to know of anyone that wants to buy a Mtn. Hardware system? \$450 or best offer?)

—Kirkland, Washington

I would like to tell you that after having used the system ONLY ONE DAY, that I am absolutely delighted with it. In addition, I purchased the three boards although I ALREADY own Mountain Hardware's music system. Now that I have seen and own your system, I am putting my "old" one up for sale. I think that your software makes it far easier to enter music, and that the software routines allow for far greater flexibility. Again, I extend my compliments to you. As I said, I have owned another music system, and consider myself therefore, qualified to make a judgement between the use of the two. Yours is the clear choice!

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with the newest small computers
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New York Computer Expo

Albert Hall Sheraton Centre,
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Aug. 12-15, 1981

Minis / Micros / Software / Peripherals
Services / Free Lectures

Once again, the fascinating world of computers is presented in the heart of New York City for business, science, education, professionals and personal users.

It's the greatest opportunity on the east coast to get an up-date education on what's new by visiting 15,000 square feet of exhibits and attending lectures given by expert computer scientists and educators.

SPECIAL "BUSY EXECUTIVE" SESSION

New York Computer Expo presents an ancillary opportunity for the busy executive who feels it's time to become familiar with computers and the world of data processing, quickly, efficiently and at a low cost.

The aim of this special session is to show the busy executive how to approach data processing technology, how to cope with it on an administrative basis, how to keep ahead of it, and how to put this knowledge to immediate use.

The tutorial covers about five hours, and will be given once each day, Aug. 11 through Aug. 15. Each tutorial has limited registration. Hours are 9 a.m. to about 3 p.m., with time for lunch and a coffee break.

Each registrant will receive an original workbook and computer language dictionary. Four-day registration for the New York Computer Expo also is included. Total fee for the session is \$200.

EXECUTIVE TUTORIAL OUTLINE

SECTION 1. COMPUTER FUNDAMENTALS

In this section of the course you'll learn what a computer is, how it's put together and how you make it do the things you want it to do.

A. ABC's of Computers

-What a computer actually is and what it's not.

-How a computer works. The in's and out's of number systems.

B. Computer Hardware

-The basic parts of a computer.

-CPUs-An introduction to the different types.

-Memory--RAM, ROM, EPROM, ETC.

-Peripherals.

C. Computer Software

-The anatomy of simple computer language--BASIC.

-Software buzzwords.

-An overview of the major computer languages--Assembler, FORTRAN, COBOL, PASCAL PL/1, APL, ADA, C, FORTH, LISP and more.

-Packaged software--why you may need it.

-Specialized software--Data base/data management systems, etc.

D. Computer Configurations

Putting computers, terminals, etc., together in more complicated ways to improve efficiency.

-Time sharing

-Data communications

-Distributed processing.

E. A look at the People Side of Data Processing

What are all those people *really* doing? Functions of various types of computer personnel: programmers, systems analyst, data entry personnel, operators, etc.

F. An Overview of Computer Applications

An introduction to some of the things computers are being used for.

SECTION 2. HOW TO CHOOSE, INSTALL AND OPERATE A COMPUTER

A. Defining Your Needs

-The feasibility study. How to cost out the obvious computer applications.

-Setting up a computerization timetable.

-Long-range computer and office automation planning.

B. Finding Out What's Available to Fit Your Needs

A comprehensive overview of the current state of the art in computers, peripherals and software. We'll even give you a peek into the future at what might be available in the years to come.

C. How Much Work to Do in-House and How Much to Contract Out

An information-packed discussion of the available sources of outside help: computer stores, systems houses, contract programmers, service bureaus.

D. How To Handle A Vendor

-How to solicit bids and pick the best one.

-Computer contracts--picking your way through the minefield.

E. Conversion

How to get from your current systems to your new system.

F. The Care And Feeding Of Computer People

How to find and keep the right personnel in a *very* tight market.

SECTION 3. WHERE TO GET MORE INFORMATION

—Introduction to computer organizations.

-Finding other companies and executives in similar circumstances.

-A complete, annotated bibliography of the best and *clearest* books in the field.

ABOUT THE INSTRUCTOR

The instructor for the course is Barbara Schwartz. The course lecture and workbook is all original material created by her. She is a consultant to major corporations and small businesses and is a writer on computer and data processing topics. She has taught courses for companies and schools in simple clear English.

FREE LECTURE SCHEDULE

	August
Introduction to Small Systems for Business	12 & 13
Introduction to Personal Computing	12 & 15
Selecting a Small Computer for Business for the First-Time user	12 & 14
Computer Performance in an Accounting Environment	12 & 14
Survey of Graphic Packages Available for Micros	12 & 13
All About Printers for Business	12
Understanding the Cost of Business Software	12 & 13
The Computer as a Scientific research Tool	12 & 14
CP/M Update	14
Interfacing to the Real World	13 & 15
The Multi-Lingual Microcomputer	13
Introduction to COBOL for Microcomputers	13 & 15
Using a Microcomputer for Technical Analysis of Stocks & Commodities	13 & 14
Survey of Computer-Assisted Instruction	13 & 15
All About Printers for Personal Use	13
The Next Five Years in Small Computers	14 & 15
Applying PASCAL	14
Microcomputers and Medicine	14
The Beauty of FORTRAN for Small Computers	14 & 15
The Future of the Home Terminal	15
Selecting a Small Computer for Personal Use	15
Uses of the Microcomputer in Education: New Directions	15

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NEW YORK COMPUTER EXPO

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AUG. 11 AUG. 12 AUG. 13 AUG. 14 AUG. 15

Mail with applicable payment. Use one form per person. Registration badge will be sent by mail in early August. Check or money order only.

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<input type="checkbox"/> Accounting Firm	<input type="checkbox"/> Engineering	<input type="checkbox"/> Personnel Agency
<input type="checkbox"/> Advertising -Marketing	<input type="checkbox"/> Entertainment/News	<input type="checkbox"/> Professional Services
<input type="checkbox"/> Banking/Insurance	<input type="checkbox"/> Government/Military	<input type="checkbox"/> Research/Development
<input type="checkbox"/> Real Estate/Credit/Securities	<input type="checkbox"/> Hospital	<input type="checkbox"/> Transportation (All)
<input type="checkbox"/> Communications	<input type="checkbox"/> Hotel	<input type="checkbox"/> Utility
<input type="checkbox"/> Computer Consultant	<input type="checkbox"/> Industrial Design	<input type="checkbox"/> Wholesale/Retail Sales
<input type="checkbox"/> Computer Dealer/Dist.	<input type="checkbox"/> Law Office	<input type="checkbox"/> Other (Please Specify)
<input type="checkbox"/> Construction/Architecture	<input type="checkbox"/> Management Consultant	
<input type="checkbox"/> Education	<input type="checkbox"/> Manufacturing	

Check your primary job function.

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<input type="checkbox"/> Administrator	<input type="checkbox"/> DP/WP Manager/Operator	<input type="checkbox"/> Scientist
<input type="checkbox"/> Bookkeeper	<input type="checkbox"/> Doctor	<input type="checkbox"/> Skilled Laborer
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<input type="checkbox"/> CPA	<input type="checkbox"/> Programmer	<input type="checkbox"/> Other (Please Specify)
<input type="checkbox"/> Creative Arts (All)	<input type="checkbox"/> Purchasing	

Your primary interest in computers (check only one) Business Personal Both

Mail prior to July 24, 1981. No foreign mail orders. New York Computer Expo. 110 Charlotte Place, Englewood Cliffs, NJ 07632
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Sharp's New Business and Pocket Computers

Sharp Electronics Corporation introduced two new computers at the National Computer Conference in Chicago, the YX-3200 Business Computer System, a desktop computer featuring a step-by-step programming aid, and the PC-1211 Pocket Computer, which is smaller than a paperback novel.

Very encouraging

Don Lawrence, National Sales Manager, Systems Division, says that the YX-3200 will be offered nationwide after a six-month evaluation period. The complete system includes a central processing unit with keyboard, high resolution CRT display with easy-to-read characters, dual-drive floppy disk and an impact printer.

"The YX-3200 Business Computer is a carefully designed product for the aggressive businessman who demands a low-cost, highly efficient computer that can grow as his business grows," Lawrence says. The versatility of the system also allows firms to install it in various departments for information-control purposes. The easy-to-use programming aid allows the operator to respond to the YX-3200's questions to perform his tasks, Lawrence said.

The desktop system, with a 32K ROM and 64K RAM, features an automatic program generator which poses questions to the user that, when answered by a simple yes-or-no in most cases, writes the desired program, the company said. The YX-3200 features an easy-to-understand extended BASIC language.

Easily expandable, the YX-3200 can accommodate up to 72K ROM and 128K RAM. The Sharp 5 1/4-inch floppy disk drives—dual-sided, double density—can store up to 285K bytes per diskette. The YX-3200 can



The YX-3200 features a high-resolution CRT, disk drives and an impact printer.

accommodate a maximum of eight disk drives.

The high-resolution 12-inch CRT display offers upper and lower-case green characters on an 80 column/24 line screen for a total of 1920 characters, the company said. Another feature of the display is its capability to increase character size for group viewing or dramatic graphics.

The system printer, a bi-directional dot-matrix 80 character per second printer, offers an 80/132 column-per-line capability.

Application software to be included with YX-3200 System includes general accounting, inventory, general ledger, accounts receivable, accounts payable, word processing, and order entry.

The suggested retail price of the YX-3200 Business Computer System is under \$6000.

The Pocket Computer

"The features of the PC-1211 rival some of those so-called 'full-



The PC-1211's dot matrix display scrolls right or left, handling up to 24 characters.

size' computers," Lawrence said, "and with the addition of the optional interface and hard-copy printer, the Sharp pocket computer will broaden the universe of computer users."

Not just an advanced calculator, the PC-1211 boasts 1.9K RAM memory which is programmable through the keyboard or, with the addition of the optional CE-121 or CE-122 Cassette Interfaces, the user can expand storage capabilities by interfacing with a cassette recorder. The printer option allows the user to keep a record of programs and print out results.

With the use of BASIC, the operator has 22 statements and 12 commands at his disposal, which, the company claims, approaches the versatility of some microcomputers already on the market. Programs of 60 to 70 average lines are possible on the PC-1211.

The Pocket Computer employs the BASIC programming language and features a capacity of 1424 program steps with 26 variables. The alphanumeric keyboard is arranged in the familiar "QWERTY" typewriter format, and both characters and numerals appear on the 24-digit dot-matrix liquid crystal display panel.

The PC-1211 carries a suggested retail price of \$249.95 which includes three manuals that explain the benefits of the device, including precise instructions on how to design more than 125 programs, the company said. The CE-121 cassette interface carries a suggested list price of \$50 and the CE-122 hard-copy printer is available for a suggested list price of \$150.

For more information contact Sharp Electronics Corp., 10 Keystone Place, Paramus, NJ 07652.

Circle No. 111 continued on page 101

SYSTEM

Hard Disk System

The Chieftain 98W10, a 10 Mbyte hard disk system from Smoke Signal Broadcasting is a 6809 based CPU systems, with 32K of RAM (expandable), two serial I/O ports, one 8-inch double-sided double-density floppy drive (1 Mbyte disk storage) and one 8-inch 10 Mbyte Winchester hard disk.

The Chieftain 98W30 is the larger version of the 98W10. The 98W30 supports a 30 Mbyte 8-inch Winchester. The Chieftain 98W10 will be running OS-9 Level I multi-user, multi-tasking operating system and application software. BASIC 09, the high-level incremental BASIC compiler for the OS-9 series is 95 percent USCD Pascal program compatible.

For more information contact Smoke Signal Broadcasting, 31336 Via Colinas, Westlake Village, CA 91361; (213) 889-9340.

Circle No. 112

Self-Contained Unit



Datamyte's Model 234 microcomputer, incorporates a display, plain-paper printer, floppy-disk drive and a full keyboard in a package about the size of an electric typewriter.

The machine is self-contained with its 64K of RAM. The CP/M operating system brings the computer to working level within 30 seconds without special prompting.

With an acoustic coupler attachment, the Model 234 is a data-communications terminal that can tie in

to a distributed data-processing network. The built-in 5 1/4-inch disk drive can be augmented with an auxiliary disk to increase its file-handling capability. Weighing 31 pounds, the machine is sufficiently portable to be moved to installations where it can serve as an intelligent terminal to host computers in large organizations.

The price of the Model 234 microcomputer is \$6980. For further information contact Datamyte Inc., 527 Madison Ave., New York, NY 10002; (212) 752-1203.

Circle No. 113

Desktop Microcomputer

Cascade Data has announced its new Consort series of microcomputer systems, intended for use by the small-business computer market.

The Consort is the smallest system in Cascade's product line. Weighing 50 pounds, it has flexible diskettes and a 1920 character video-display unit. The physical dimensions of the Consort processor (11 inches high, 18 inches deep and 17 inches wide) make it easy to fit into almost any office environment.

Cascade offers three printers with the Consort; a 55 character-per-second letter quality model, a 150 character-per-second dot-matrix data printer and an 80 character-per-second dot-matrix data printer. The Consort uses CP/M and Cascade offers six standard accounting modules which automatically feed the general ledger, the seventh module.

A word-processing system is available with Consort and features automatic disk buffering, on-screen text formatting, automatic margination, justification, line spacing and centering and flexible find and replace commands.

The Consort will run languages such as 8080 Assembler, Z80 Assembler, Compiled Microsoft BASIC, Microsoft COBOL plus Pascal and FORTRAN.

This first release of the Consort includes 64K memory, two 1.2 Mbyte double-sized, double-density floppy-disk drives, and the 1920-character video-display unit. The seven available accounting applications include accounts receivable, accounts payable, inventory, purchase order entry, sales order entry, payroll and general ledger.

The price ranges from \$8900 to \$12,500, depending on the printer package. For more information contact Cascade Data Inc., 6300 28th St. S.E., Grand Rapids, MI 49506; (616) 942-1420. *Circle No. 114*

INPUT/OUTPUT

Conversational CRT



A conversational terminal named CHAT has been announced by Volker-Craig. CHAT's features include switch-selectable compatibility with the Lear-Siegle ADM-3A and the company's own VC404.

Other features of the CHAT include a 12-inch black-and-white screen with an anti-glare filter and a detached full keyboard, numeric key pad with enter key, cursor keys, complete cursor addressing, and 12 program function keys. The terminal will display a total of 1920 characters with user-selected highlighting. The 128 available characters are formed on a 7 x 9 dot matrix. A built-in bi-directional serial printer

THE LEAST EXPENSIVE PROGRAMS YOU CAN BUY.

Up to 77 high-quality programs for TRS-80, only \$10.95

NewBasic—expands disk basic

NewBasic, from Modular Software Associates, adds tremendous power and flexibility to Level II or disk Basic. The disk version includes a unique CREATOR program which allows you to customize NewBasic to include any or all of over 30 new commands. Level II NewBasic includes all of the non-disk commands found in disk NewBasic. A few of the many new features added include:

SPOOLING-DESPOLING (disk version)—Allows printer output to be "spooled" to disk instead of being printed. Later, the file may be "despooled" (i.e. printed out) while the computer can still run Basic, as usual (another program, or you input a program!).

NEW TRACE UTILITY—Now trace more than just a line number! This trace facility displays (LISTS) the line being executed, as well as the current value of specified variables and expressions.

SOUND AND GRAPHICS—Easily create music or sound effects with the versatile SOUND command. Lines and rectangles may be effortlessly drawn with the new graphics commands: LINE, RECT, and FILL.

RS232—NewBasic allows you to initialize your RS-232-C, receive input from it, or output to it—all from within Basic!

QUICK KEY ENTRY—Over 35 pre-defined keys allow you to "type" most any common Basic keyword quickly and without errors.

Blinking cursor; Repeating keys; Lowercase driver; DO-UNTIL; Line labels; RESTORE any DATA line...

and **MUCH more**, including many features not available elsewhere. The finest enhanced Basic package available for your Model I!

Disk version (1 drive, 32K min.) (\$31.75 CA) **\$29.95**
Level II (cassette) version (16K min.) \$19.95 (may be upgraded to disk for \$10.95) **\$19.95**

SuperPIMS—People's Database

PIMS has been greatly speeded up and simplified, with machine-language sorts, key debounce, optional automatic lowercase (no keying, no hardware mod) on labels or reports. Up to 20 fields, limited by 240-character maximum per record. Easy to revise, add records, split or merge files, sum or average any fields. Customized for tape, tape & disk, Zoom, TC8 Poor Man's Floppy, B17, Stringy Floppy—all on one tape! As mailing labels program, easily manages 20,000 list. CIE does! Advanced labels module to come, \$24.95, making system most powerful mailer available! **\$19.95** (\$21.15 CA) book, details uses (CIE) **\$11.95** (\$12.67 CA)

NewDOS-80—New Low Price!

Successor to NewDOS+, same package for which you pay \$149 elsewhere, at CIE just...
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Games for color TRS-80

Modular Software Assoc. tape contains:
• PONG-80 • ENTRAP • DEMOLISH (like Breakout) • TRAFFIC (Grand Prix auto race)
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CIRCLE 59

HARDWARE UPDATE

port and 15 data rates up to 19.2K with independently selectable transmit/receive speeds are also standard. The unit is housed in a metal cabinet, runs on a 100 or 240 volt line, and the display locks automatically to the 50 or 60 Hz line frequency.

The price is \$645. For further information contact Volker-Craig, Inc., 333 Metro Park, Rochester, NY 14623; (716) 475-1221.

Circle No. 115

Printing Terminal



A printing communications terminal called the LEX-21 features a built-in modem, a full-function keyboard, and a thermal printer which displays upper and lowercase characters. The terminal measures 8 1/2 inches x 11 inches x 2 3/4 inches, weighs five pounds, and fits into half a standard briefcase.

A 2K memory for text composition and editing and a 1K line buffer are standard in the LEX-21. An industry compatible communications protocol allows transmission rates of either 10 or 30 characters per second, the company said. Options include a numeric keypad and a leather carrying case.

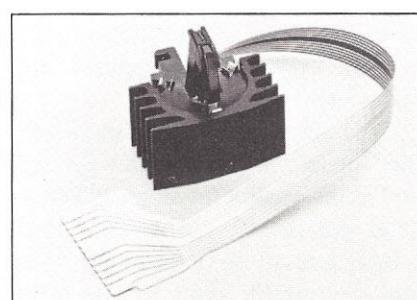
The price for the LEX-21 is \$1195. For more information contact Lexicon Corporation, 8355 Executive Center Dr., Miami, FL 33166; (305) 592-4404. *Circle No. 117*

COMMUNICATION

Integral Modems

Rockwell International has introduced its R24 integral modems, transmitting data between two AIM 65 microcomputers. The R24 is a 2,400 bps, synchronous modem intended to be assembled on one or more of the system boards of terminals and other data equipment.

The modem is available in three different configurations. It can be modular, on three boards each approximately three inches per side, for design flexibility. Or the R24 can



Although substantially improved, the Micro-Nine-A is still considered a "disposable" head. Retail price is less than \$40, and installation requires no tools and takes less than a minute to accomplish, the company says.

The Micro-Nine-A is currently available as a replacement printhead and is included as standard on the MX-80. For more information contact Epson America, Inc., 23844 Hawthorne Blvd., Torrance, CA 90505; (213) 378-2220.

Circle No. 116

NEW!!! THE ELECTRIC MOUTH*



ELF II VERSION

for \$100, Elf II, Apple, TRS-80 Level II*

From \$99.95 kit

Now — teach your computer to talk, dramatically increasing the interaction between you and your machine.

That's right: the ELECTRIC MOUTH actually lets your computer talk! Installed and on-line in just minutes, it's ready for spoken-language use in office, business, industrial and commercial applications, in games, special projects, R&D, education, security devices — there's no end to the ELECTRIC MOUTH's usefulness. Look at these features:

- ★ Supplied with 143 words/letters/phonemes/numbers, capable of producing hundreds of words and phrases.
- ★ Expandable on-board up to thousands of words and phrases (just add additional speech ROMs as they become available).
- ★ Four models, which plug directly into \$100, Apple, Elf II and TRS-80 Level II computers.
- ★ Get it to talk by using either Basic or machine language (very easy to use, complete instructions with examples included).
- ★ Uses National Semiconductor's "Digitalker" system.
- ★ Includes on-board audio amplifier and speaker, with provisions for external speakers and amplifier.
- ★ Adds a new dimension and excitement to programming; lets you modify existing programs and games to add spoken announcements of results, warnings, etc.
- ★ Installs in just minutes.

Principle of Operation: The ELECTRIC MOUTH stores words in their digital equivalents in ROMs. When words, phrases, and phonemes are desired, they are simply called for by your program and then synthesized into speech. The ELECTRIC MOUTH system requires none of your valuable memory space except for a few addresses if used in memory mapped mode. In most cases, output ports (user selectable) are used.

Spoken Material Included:

one	eighteen	at	dollar	inches	number	ss	c	t
two	nineteen	cancel	down	is	second	d	u	v
three	twenty	case	equal	it	off	set	e	w
four	thirty	cent	error	kilo	on	space	f	x
five	forty	400hertz tone	feet	left	out	speed	g	z
six	fifty	80hertz tone	flow	less	over	star	h	y
seven	sixty	200hertz tone	feel	longer	synthesis	start	i	z
eight	seventy	40ms silence	garden	limit	percent	stop	o	
nine	eighty	80ms silence	go	low	please	than	k	
ten	ninety	160ms silence	gram	lower	plus	the	l	
eleven	hundred	320ms silence	great	mark	point	time	m	
twelve	thousand	centi	greater	meter	pound	try	n	
thirteen	million	check	have	mile	pulses	up	o	
fourteen	zero	commas	high	rate	volt	p		
fifteen	again	control	minus	re	weight	q		
sixteen	ampere	danger	hour	minute	ready	a	r	
seventeen	and	degree	in	near	righ	b	s	

*"Elf II" and "The Electric Mouth" are reg. trademarks of Netronics R&D Ltd. "Apple" is a reg. trademark of Apple Computer Inc. "TRS-80 Level II" is a reg. trademark of Tandy Corp.

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<input type="checkbox"/> TRS-80 Level II "Electric Mouth" kit	\$119.95

Add \$20.00 for wired & tested units. All plus \$3.00 postage & insurance. Conn res. add sales tax.

Total Enclosed \$ _____

Personal Check Cashier's Check/Money Order

Visa Master Charge (Bank No. _____)

Acct. No. _____

Signature _____ Exp. Date _____

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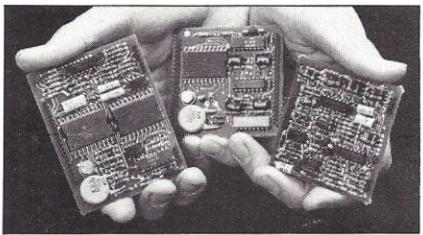
City _____

State _____ Zip _____

CIRCLE 60

be on one board, five inches by six inches. It also is available as the R24 Modem Evaluation Board (R24MED), equipped with an edge connector and interfacing circuitry.

The transmitter and receiver (TI, RI and R2 in the modular configuration) are compatible with Bell 201 B/C and CCITT V.26 A/B standards. Extremely high performance is achieved with a transmitter design based on differential phase modulation and a receiver design using coherent phase detection techniques, the company said.



The R24 uses differential four-phase modulation at 2,400 bps. The signalling rate is $1,200 \pm 0.1$ percent and the carrier frequency is $1,800 \pm 1$ Hz. It also can operate on a two-wire private-line half-duplex mode or on a four-wire line full-duplex mode. With minimal interfacing circuitry, the R24 can be configured for operation on dedicated lines or over the general switched network.

The R24 three-module modem set is priced at \$395. For more information contact Rockwell International, 3310 Miraloma Ave., P.O. Box 3669, Anaheim, CA 92803; (714) 632-2321. Circle No. 118

Line Driver

Tri-Comm Industries, Inc. announced the availability of a low-cost, high-efficiency, synchronous-line driver, the SLD-1, designed to provide data transmission over unloaded twisted pair at rates up to 19.2k bps. The SLD-1 is able to operate in a multi-point environment, which reduces cable runs and computer ports required by limited dis-



tance, point-to-point modems.

CMOS circuitry allows for low power and heat dissipation. The SLD-1 also uses an internal crystal control oscillator to control clock rates and a scrambler, which gives long-term stability over the transmission link. Clock recovery is also accomplished with a digital phase-lock loop, which does not require any adjustment as the data rate is changed.

The SLD-1 comes in both rack-mount and stand alone versions. It also provides diagnostics, including status indicators, which display operating conditions and both line and digital loop backs. The rack-mount version will accommodate up to 16 line drivers in a single rack-mount unit. Transmission rates are switch selectable from 1,200 baud synchronous to 19.2 synchronous. Front panel selection of fall-back data rates for either 3/4 or 1/2 speed is also included as a standard feature of the SLD-1.

The price of the SLD-1 is \$365. For further information contact Tri-Communications Industries, 20 Fitch St., East Norwalk, CT 06885; (203) 866-1154. Circle No. 119

PERIPHERALS

Mini Disk Drives

Percom Data Company now produces mini-disk storage systems for the Radio Shack TRS-80 Model III computer.

Systems may be ordered with either 40- or 80-track drives that are rated for both double- and single-density operation. Using Percom drives, a TRS-80 Model III owner

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DIVISION OF MARK GORDON ASSOCIATES, INC.
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Atari 800 W 16K	799.00
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Model II 64K System	3499.00
16K Model III	879.00

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40 Track 5 1/4 inch drive	314.00
80 Track 5 1/4	544.00
4 Disk Drive Cable	39.00
Lobo w/controller	Call for price
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PRINTERS

Epson MX80	Call for price
Epson MX 70	Call for price
Okiidata Microline 80	479.00
Okiidata Microline 82	699.00
Okiidata Microline 83	989.00
NEC 5510 w-tractor	2679.00
Diablo 630	2495.00

MISC HARDWARE

Expansion int TRS-80(Ok)	269.00
Novation D-Cat Modem	166.00
16K Memory Kit	35.00(2/65.00)
Leedex Monitor	149.00
Leedex 100G	169.00
Leedex Color Monitor	399.00
Printer Cable for above	49.00
ISO-2 Isolator	54.00
AC LINE FILTER	24.00
280 Softcard	289.00
Ramcard	169.00
Videx 80 COL BOARD	289.00
Videx KBD Enhancer	109.00
DC Hayes Micro Modem II	319.00
CCS and SSM Interface Cards	Call for price

STORAGE MEDIA

Scotch-box 10-5 1/4	27.00
Memorex-box 10-5 1/4	22.00
Plastic Storage Box	5.00
Verbatim 5 1/2	25.00

OPERATING SYSTEMS

NEWDOS by APPARAT INC.	49.00
NEWDOS + by APPARAT INC.	99.00
MMS FORTH DISKETTE PRIMER	79.95
NEWDOS 80	135.00
VTOS	99.00

BUSINESS SOFTWARE FOR TRS-80, APPLE AND ATARI

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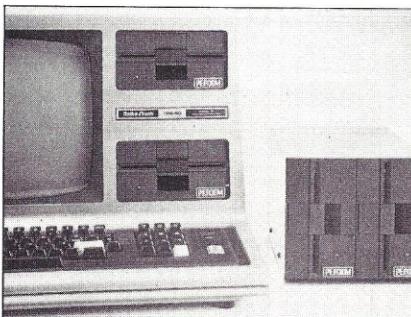
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HARDWARE UPDATE



can expand a computer with from one to four drives, adding from 102 kbytes to almost 1.5 Mbytes of on-line formatted storage capacity. Moreover, both drive models are capable of "flippy" operation, so that diskette storage can be twice the on-line capacity, the company said. All drive-system configurations meet Federal Communications Commission requirements for non-interfering electromagnetic radiation by computers in residential environments.

The first two drives mount inside the computer; drives number three and four mount externally. The initial internal drive comes complete with a four-drive controller, a two-drive power supply, interconnecting cables for the two internal drives, a double-density disk operating system and miscellaneous mounting hardware.

The Percom four-drive controller features data separation and write precompensation circuitry, and is capable of handling two-headed drives, as well as single-density 8-inch drives.

The internal drive system sells for \$749.95 in the 40-track version and \$914.95 in the 80-track version. The second internal drive, which includes the drive mechanism, electronics and installation hardware, sells for \$315 in the 40-track version and \$474.95 in the 80-track version.

External drives may be ordered in one- or two-drive configurations, in either 40- or 80-track versions. A single 40-track "add-on" drive sells for

\$439; a dual 40-track "add-on" sells for \$878. Prices for single and dual 80-track "add-ons" are \$620 and \$1230. A two-drive interconnecting cable for external drives costs \$29.95. The cable is optional.

For more information contact Percom Data, 211 N. Kirby, Garland, TX 75042; (800) 527-1592. Circle No. 120

Disk Controller



Lobo Drives International offers a new disk-controller board for the Apple computer. Identified as the Lobo LCA-22, the new controller is completely software compatible with Apple DOS and contains 256 bytes of on-board Boot ROM.

The LCA-22 controls up to four 8-inch, single- or double-sided, single- or double-density disk drives with a total storage capacity of 4.4 Mbytes. Average access time is 200 ms. The LCA-22 has been designed to run in slots one through seven, and is not restricted to a single location.

The LCA-22 comes complete with controller card, cable, diskette and documentation. Delivery is from stock and the price is \$699. For additional information contact Lobo Drives International, 354 S. Fairview Ave., Goleta, CA 93117; (805) 683-1576. Circle No. 121

SOFTWARE UPDATE

EDUCATIONAL

Grading Software

Charles Mann & Associates, Micro Software Division has announced a version of its "The Grading Systems Programs" for school administrators. The package includes systems for class roster development, teacher schedule preparation, student grade entry, report card preparation, master record development, and student file management.

The software offers an extended operating manual, a full featured system of programs for the school administrator, and a complete student counselling and guidance management system. The system offers the printing of class rosters, report cards, honor roll lists, master records, and file folder labels.

The system is available for \$299.95 including a specially designed light pen for use in grade input. Documentation is available for \$25 for previewing. For more information contact Charles Mann & Associates, Micro Software Division, 7594 San Remo Trail, Yucca Valley, CA 92284; (714) 365-9718.

Circle No. 122

Instructor Gradebook

Serendipity Systems Inc. announced the introduction of an application software package to their line of products designed for the Apple II Plus, or the Apple II with Applesoft firmware. Instructor Gradebook records and reports individual and class performance for classes of up to 400 students, and statistically measures the effectiveness of teaching and evaluation techniques, the company said.

Designed in accordance with standard grading practices, Instructor Gradebook offers seven defined and two optional grading categories such as test, homework or quiz which are

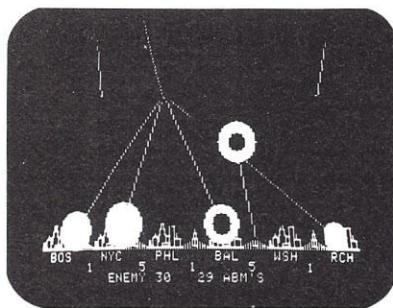
then "weighted" by the user to produce final scores. Marks can be entered either as numbers or as letter grades corresponding to user-defined value ranges. Reports available include alphabetized class lists, blind grade listings by student I.D. for

posting, individual performance reports and permanent class records. Evaluation statistics—median, average, high and low scores and standard deviation calculated for each marking segment or for final grades, plus the actual scores reported as his-

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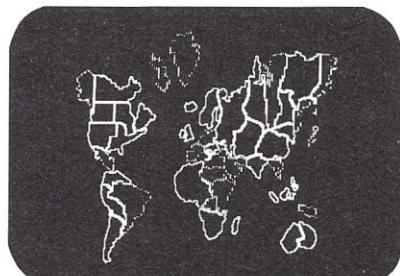
ABM by silas warner

Invader and Asteroids move over.... ABM has arrived! Command your launch sites to fire 1 and 5 kiloton anti-ballistic missiles (ABMs). Save the East Coast from increasingly fierce Enemy nuclear attack. Position your target crosshairs to blast the green streamers before they fireball your cities—or worse—split into multiple warhead MIRVs turning the entire coast into a thundering specter of destruction. Hi-res color graphics, sound, high score to date memory, paddle or joystick control. On disk, requires Applesoft ROM. (\$24.95)



GLOBAL WAR by alan boyd

A challenging strategy game for 2 to 9 players. Your 'War Room' features a detailed map of the earth plus territorial occupation status and invasion strategy displays. Players are assigned armies and territories and the war begins. The computer battle simulator calculates the results of each invasion. Occupy all countries and you are the Winner! Games may be saved on disk to be continued later. On disk, requires 48K and Applesoft ROM. (\$24.95)



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tograms of grade distribution—can provide insights on curriculum design and testing procedures for the instructor, the company said.

The Instructor Gradebook package includes a 30-page self-teaching instruction manual written in non-technical language. Video display illustrations, comprehensive data entry instructions and error prevention features, and specimen report formats guide the computer novice through the package's easy-to-master menu of program options and promptings, the company said.

Instructor Gradebook is available for \$169. For more information contact Serendipity Systems Inc., 225 Elmira Rd., Ithaca, NY 14850; (607) 277-4889. *Circle No. 123*

Computer Literacy

Science Research Associates, Inc., has introduced Computer Discovery, an interactive courseware program in computer literacy designed principally for junior and senior high school students. The program offers more than an introduction to the computer: it involves the student with both programming concepts

and social issues related to computers, the company said.

The program consists of two 5½-inch diskettes for the Atari 800, Apple II, and Apple II Plus with Applesoft. Using a teacher directed approach, including group introduction to each chapter, Computer Discovery can be completed in approximately six weeks of normal presentation, the company said. The program also can be used individually on a student-directed basis. In this manner, a student working with the workbook and computer could complete the course in as little as 15 hours, without the direct involvement of a teacher, the company said.

Student and instructor's workbooks are also available, and all print components are published in both junior and senior high school versions. The instructor's guide contains educational objectives, references, individualized class activities and answers to the exercises for each chapter of the workbook. The price is \$195. For more information contact Science Research Associates, Inc., 155 N. Wacker Dr., Chicago, IL 60606; (312) 984-2053.

Circle No. 124

HIPAD DIGITIZERS

Inexpensive Graphic Input To Your Computer

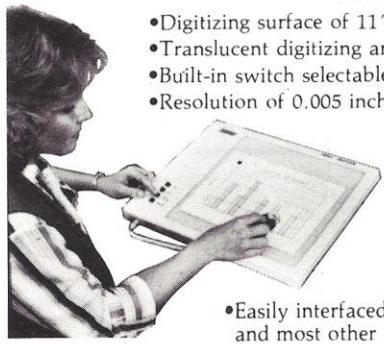
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The HIPAD™ Series Digitizers are the ideal graphic input devices for the small system user. Utilizing the principle of X-Y coordinates to obtain positioning, they convert graphic coordinates into digital data that can be processed by the computer.

Featuring:

- Digitizing surface of 11" x 11" (28cm x 28cm).
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CIRCLE 63



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HOME

Analyze Phone Bills

Long Distance Analyzer, a business program for disk-based TRS-80s, streamlines accounting for long-distance telephone costs. Matching your bill with your file of recognized numbers, the program identifies where your calls go.

Calls are grouped and totalled by number to help you track costs, bill clients and investigate unfamiliar numbers. Your usage patterns are analyzed by area code, state and WATS zone. The "recognized number" file prints out as a directory.

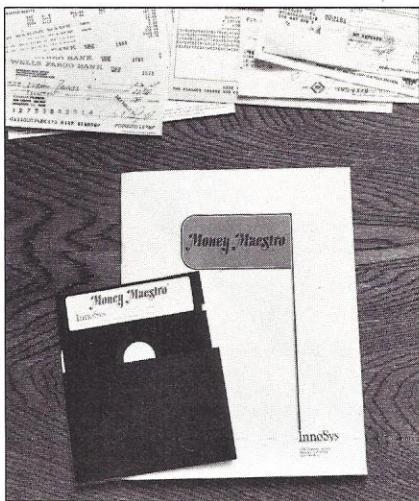
Minimum hardware is 16K, Level II, and disk drive; printer is optional. There is no connection to your phone system. Cassette version for Models I and III is \$95; disk version is \$135. Model II disk costs \$155.

For more information contact Golden Braid Software, P.O. Box 2934, Sarasota, FL 33578; (813) 371-0388. *Circle No. 125*

Home Banking System

InnoSys Incorporated, a supplier of software to the banking industry, has entered the personal computer market with its Money Maestro home-banking system. This system is designed to provide financial recordkeeping, tax reporting and budgeting for professionals, clubs, families and very small businesses.

Based around the user's checkbook, the system records all deposits, payments and charges by category (or group of categories) and payee while keeping a check register. These records are supplemented by entries of all financial transactions which don't affect the account balance (charge cards, cash payments, and so forth) so that Money Maestro can give complete reports on budget status, payment histories and all income or expenses by category. Its stockpiling feature allows the pre-



view of bills before payment and holds partial payments or regularly occurring payments for later payment.

Money Maestro responds to the growing demand for self-documenting, user-friendly applications which can be run by the novice or computer professional. Budgeted amounts are established by the user independently for each category and month and may be reset at any time. Categories of income and expenses are given a three-digit number but can be recalled for use by either name or number. Clients and vendors may be accessed for histories of payments and deposits by as little of their name as is required to identify them.

This software is available for CP/M systems with 48K of memory, and 140K of disk storage. The price is \$200. The manual costs \$20. For further information contact InnoSYS Inc., 2150 Shattuck Ave., Suite 901, Berkeley, CA 94804; (415) 843-8122. *Circle No. 126*

UTILITY

Printer Utility

Microtek, Inc. announced a software package for their MT-80S dot matrix printer to support the APL character set with full overstrike capability. The MT-80S-APL prints

in ASCII or APL mode at 70 lines per minute and lists for \$995.

With the APL software, the user may switch between APL printing at 10 characters per inch and 96-character ASCII printing at five, 10 or 15 characters per inch, the company said. With APL printing selected, the printer's internal logic detects and validates all overstrikes defined by a character-backspace-character sequence and prints valid overstrike pairs as legible pre-formed composite characters.

Existing MT-80S printers may be retro-fitted in the field with the APL kit at a price of \$170. For more information contact Microtek, Inc., 9514 Chesapeake Dr., San Diego, CA 92123; (714) 278-0633. *Circle No. 127*

Text Editor

Westico announced a video text editor called Mince, which offers continuous, no-clutter textual display and short, easy-to-remember commands, the company said.

Mince can edit several files simultaneously. Text can be moved between files and the screen can be split to display any two of them. Text can be manipulated by the word, sentence or paragraph as well as character, line and entire screen. There are features such as commands to change words to uppercase, lowercase or capitalize and deleted text is saved and can be restored. Global replace results can be "tried out" and then accepted or rejected, the company said.

Mince is written in the C programming language and offers an upward compatible path from 8080/Z80 micros to 16-bit micros and mini-computers. A programmer or document editor who currently uses a microcomputer can eventually upgrade to one of the larger 16-bit machines and use the same software product.

Mince works on North Star,

Radio Shack's TRS-80 Model II and others which have CP/M-compatible operating systems. Mince is \$125 for software and documentation. Documentation alone is \$20. For more information contact Westico, Inc., 25 Van Zant St., Norwalk, CT 06855; (203) 853-6880. *Circle No. 128*

Plotting System

Escape Ltd. announced the Daisywheel Plotting System, a graphics package specifically for daisywheel printers. The system has 64 Kbytes of memory, is written in FORTRAN and operates with computers using the CP/M operating system. Line, bar, and circle graphs can be produced with little programming effort, the company said.

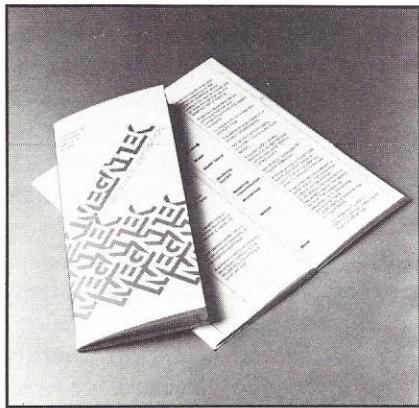
The Daisywheel Plotting Software consists of 60 user-callable FORTRAN routines. Line and bar graphs can be generated with a few FORTRAN statements, and other routines included in the software provide the basic plotting functions necessary to develop specific applications. Utility routines provided with the software merge graphs with text so a complete document can be printed.

The package is designed to be used by people with minimal FORTRAN experience. The Reference Manual explains each routine and is supplemented by the User's Guide Manual which explains the software structure and some 20 graphs in detail. Most applications will utilize the structure and format outlined in these examples, the company said.

The price for the Daisywheel Plotting Software is \$600. The software requires a daisywheel printer and a FORTRAN compiler. The source code (ANSI '66) is included with the purchase. For more information contact Escape, Ltd., P.O. Box 18797, Atlanta, GA 30326; (404) 255-0404. *Circle No. 129*

Graphics Glossary

Megatek Corporation has published a *Glossary of Computer Graphic Terms*, intended for use as a reference tool by both novice and sophisticated computer graphics users.



The pocket sized, 40-page booklet lists graphics terminology alphabeti-

cally from "absolute vector" to "zoom."

The booklet is available free to the general public only by writing to Megatek on company letterhead or by submitting a business card with a request. Write to Marketing Department, Megatek Corporation, 3931 Sorrento Valley Blvd., San Diego, CA 92121.

Winchester Survey

Datapro surveyed 47 users with a total of 650 installed Winchester-type disk drives and found a high degree of user satisfaction with the new technology. Asked to rate the drives on overall performance, ease of operation and equipment reliability, the majority rated them excellent in

all three categories, the company said. The results of the survey appear in a Datapro report, *All About Winchester Disk Drives*, describing Winchester technology and presenting the specifications of 163 drives from 51 vendors. The 40-page report lists the addresses of the vendors.

The company states that Winchester drives have sealed, non-removable disk modules, a feature that permits higher performance and better reliability, but creates backup problems for the user because master files are, in effect, trapped in the drive and cannot be used if the drive breaks down.

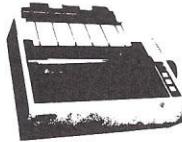
Winchester drives are available in 5.25-, 8-, and 14-inch disk sizes and offer about twice the reliability of removable disk drives. Originally developed by IBM in 1973 as high per-

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formance drives for larger systems, the Winchesters have more recently moved into the small system market as alternatives to floppy disk drives. The report traces the history of the drives, discusses the developing technology, and takes a look into the future.

All About Winchester Disk Drives, reprinted from the January supplement to Datapro 70, is available for \$15 a copy from Datapro Research Corporation, 1805 Underwood Blvd., Delran, NJ 08075; (609) 764-0100. *Circle No. 131*

Software Directories

Widl Video has just released three new 1981 summer/fall editions of *The Apple Software Directories*. Available in three volumes for busi-

ness, games and education, these directories are guides to available software for the Apple computer.

The directories are designed to help Apple users locate new programs by putting the user directly in touch with software producers. There are over 400 software vendors listed with complete addresses.

Volume One, the business directory, contains program listings from general ledger and accounts receivable programs to investment, stock evaluation and personal finance. This year a section on Apple utility programs will be highlighted as part of the business directory. This section features word processing programs, graphics software and data base systems.

Volume Two, the games directory,

lists recreational programs such as adventure, bowling and blackjack and includes word games, number games and space war games.

Volume Three, the education directory, the latest addition, contains teachers aid programs, administrative software such as grading and quiz formats and student/teacher response programs. BASIC courses are listed for every subject area including math, chemistry, general science, English, etc. at different levels of study.

All three Apple software directories cost \$5.95 each and are available from most Apple computer dealers. For further information contact Widl Video, 5245 W. Diversey Ave., Chicago, IL 60639; (312) 622-9606. *Circle No. 132*



A	B	Y	T	E	R	B	V	E	M	B	E	D
U	S	I	R	E	G	I	H	R	L	E	A	A
D	R	Y	D	O	D	N	T	A	T	T	O	H
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P	A	C	K	A	G	E	G	H	N	U	R	S
U	E	A	R	O	U	N	D	I	D	N	S	I
T	I	D	E	V	O	M	L	A	R	U	A	C

Searchword

Twenty-eight computer terms are hidden in the maze of letters. The words read forward, backward, up, down or diagonally. They are always in a straight line and never skip letters. The terms may overlap and letters may be used more than once, but not all of the letters will be used. Answers are on page 120.

Asynchronous	Graphic
Audio	Hardware
Aural	Header
Basic	Integrate
Baud	Memory
Binary	Modem
Byte	Monitor
Chip	Move
Copy	Output
Data	Package
Edit	Peripheral
Embed	Pitch
Encode	Run
Glitch	Video

Payroll

continued from page 53

general ledgers with any account numbers. In effect, the payroll packages create small general ledgers within their own programs. These are then transferred to the general ledger during regular processing. Sometimes each transaction can be tied to the general ledger, but more often, the transfer takes place during end-of-period processing.

JOB COSTING

In construction contracting, payroll costs make up a vital part of any project's total cost. So most contractors try to keep a tight rein on labor costs, and they do this by integrating payroll figures into a job-cost matrix. Six of the packages allow for this direct transfer from payroll into a job-cost program. The Osborne payroll can be completely integrated with job costing, while the Charles Mann package functions as one module of the company's job-costing software. The other programs transfer payroll data to separate job-costing software.

TERMINATED EMPLOYEES

Each package has some way of making sure terminated employees do not have to be processed during each pay period. Two methods are used. In one the terminated employees are automatically placed in a separate file after they are processed at the end of a period or quarter. At the end of the year, the payroll files of terminated employees are processed, and their totals are included in annual tax reports. Each terminated employee's W-2 form is also prepared during end-of-year processing.

In the second method, which only a few packages use, terminated employee files are closed out as soon as the employee leaves the company, and their W-2 forms are issued im-

mediately. At the end of the year, payroll data on terminated employees must be added back into the system from a permanent record. The main objection to this method is that it places the responsibility for saving W-2 forms on the employee; many people lose their W-2 forms before the end of the year and have to return to the company and ask for a copy. Thus the payroll department has to process that former employee's file and W-2 all over again. Saving this processing for the end of the year avoids this problem.

MISCELLANEOUS FEATURES

Other features that only a few packages offer include printing time-card labels and entering handwritten checks into the payroll system.

Common payroll reports

In addition to producing the actual checks and check stubs, each program produces a number of reports that summarize information about employees, their individual and combined earnings, and company finances. Several of these reports can be used as personnel management records in small businesses, because they contain much key information—earnings history, date of hiring, Social Security number, and so forth.

However, keeping a payroll file as a permanent employee file raises questions of employee privacy. Most large corporations, such as IBM, no longer use payroll files as personnel files; payroll and personnel information are kept in separate departments. IBM also no longer uses Social Security numbers as employee numbers, because it is concerned over abuse of Social Security numbers by outsiders. Of course, this sharp separation may not be possible

in a small business, but to prevent concern about any invasion of privacy, users are advised to confine their use of payroll data to payroll functions. Fortunately, most of the packages do not use Social Security numbers as employee identification numbers, usually because they allow only six-digit employee ID numbers.

Here are nine common reports that most packages produce on demand:

Employee master list. This is a complete list of all employees and all pertinent information about them. The information easily exceeds 20 or 30 items, including name, address, phone numbers, Social Security number, date of hiring, job classification or position, starting salary or wage, current salary or wage, month-to-date, quarter-to-date wages or salary, commission, tax deductions, miscellaneous deductions and union dues. The information can be printed at any time.

Check register. This is a listing of all checks that can be printed during the current pay period. It is far better to prelist a check register after the program processes and calculates the checks and before the checks are actually printed out. This prelisting is your best insurance against errors. All 15 packages produce check registers.

Payroll register. This lists all pertinent information about every employee's check for the current pay period, but it leaves out personal information on the master file. It is basically a check register in a different format, and it includes total payroll expenses in each category. All 15 packages produce payroll registers.

Employee's earnings record. All 15 packages also produce individual employee-earnings records. This

continued on page 113

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80 track TEAC drives	\$429.95
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NEWDOS 80 PATCH Patches **NEWDOS 80** to work with single or double density and the doubler.

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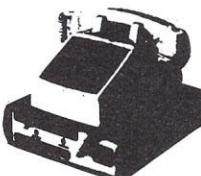
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report lists all of the payroll information on one employee.

Posting reports. All packages produce year-to-date reports, while most produce quarterly summaries and a few produce monthly summaries. The rest include period-to-date summaries in the check or payroll registers.

Payroll summary. Half of the packages produce short reports listing summaries of all payroll information: total taxes withheld, totals of each type of deduction and combined totals of taxes and deductions. *Payroll general ledger.* Seven packages produce a short report that breaks out from the consolidated payroll the general ledger accounts and their totals for each period.

Deductions report. Six other packages and one package with a payroll general ledger print out a special report that lists and totals all of the deductions, including taxes, insurance and miscellaneous deductions.

Consolidated tax report. Four packages produce a separate report that gives totals of each type of Federal, state and local withholding tax, including income, Social Security, unemployment and disability insurance taxes.

Miscellaneous reports. The BPI Systems package produces two unique reports: one that lists the total of taxes withheld above legal limits and a general ledger trial balance solely for payroll categories of expense.

Copyrights and warranties

All of the packages are copyrighted by their respective producers or distributors. This means they should not be copied, altered, given away, transmitted in a different form or sold to make a profit without the written consent of the producer. However, most of the software houses allow users to make one or two back-up copies. Unfor-

tunately there is no way to police users to determine whether they give away copies to their friends. However, it seems foolhardy for a business owner to give away a program that costs hundreds of dollars, as the best payroll packages do. Suffice it to say that unauthorized program copying is theft.

On the other hand, the warranties that the software houses offer are not very satisfactory either. Almost all completely disclaim any responsibility (implied warranties) for making sure their programs actually operate. They also remove the right to amend and improve their products without notifying users or making the improvements available to them. They also disclaim any responsibility if the program causes the user's business to lose its entire payroll file through a software error.

At best, a few houses offer good support through telephone hotlines, or they encourage their dealers to provide that support. And they will occasionally offer improvements or updates for a small fee. Obviously this lack of protection is highly unsatisfactory, and it leaves a user in the position of seeking legal remedies if a producer refuses to help solve a problem with the software.

Of course, this lack of support is a very important reason why any small-business owner should have a software or combined hardware-software maintenance contract with a dealer or service company. However, one of these days, as the problem of software piracy worsens, producers and users will have to come to some agreement about warranty protection.

Who's offering what

Taking all of these features and reports into consideration, compare the following 15 payroll packages. They are offered for the major microcomputers and those based on

the CP/M operating system. One package works with the Cromemco Cromix, UNIX-like operating system. All require 32-64K RAMs, two disk drives and a printer. All but one offers 132-column printouts.

BPI Systems, whose products are distributed exclusively by Apple, produces an excellent payroll package that meshes perfectly with its general ledger and job cost systems. All of BPI's accounting packages use the same command structure, and anyone familiar with one BPI package will easily adapt to the payroll package, which can also stand alone.

It handles four methods of compensation—salaried, regular time, overtime, hourly and doubletime hourly—four types of commission and tips. It includes nine deductions—three Federal and state taxes, an optional local tax deduction and five user-definable ones. BPI provides an annual tax update service for a small fee. It prints checks and W-2 forms, a payroll register, a payroll general ledger for integrating to the BPI GL, an individual earnings record (month-, quarter- and year-to-date), a master list and a consolidated tax report. It is also the only program that flags overwithholding of taxes and prints an excess tax report.

However, it does have several minor flaws. First, the user enters dollar amounts without commas or decimal points—that is, \$5,000 must be typed in as 500000; the program reads the last two zeros as decimal places. This would easily confuse a user who was used to using decimal points and would take some effort to get over. Second, a user must heed a warning to avoid duplicating the general-ledger entries, and, third, when a user executes an end-of-pay-period report, unless certain steps are followed exactly, essential information can be lost. This is unlikely

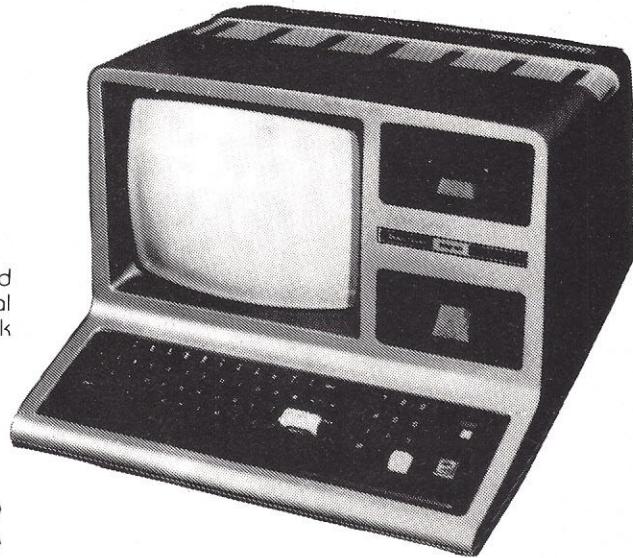
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but possible so a user must be very careful.

BPI has crammed the tax information of all 50 states and seven localities into a very powerful system based on two mini-floppy disk drives. A special tax-table disk must be used simultaneously with a data-entry disk when one updates and calculates each employee's paycheck file, but the tax-table disk is transparent, and the user does not have to "coach" the computer to fetch information from the tax-table disk. All in all, with its easily understood manual, BPI offers one of the best payroll programs.

Charles Mann & Associates produce a job-costing accounting program with an integrated payroll module for the 48K Apple II Plus and a far more limited, but less expensive, payroll system that works by itself for the Apple II and TI 99/4 (extended BASIC) computers. The job-cost payroll module is essentially an upgraded version of the separate payroll system.

The company's description of the program in its brochure is far easier to understand than its manual. The package has all of the regular features, but it will not print out checks or W-2 forms without a special additional package. The manual is very cluttered, with the information jammed together on poorly printed pages. The presentation is hard to understand, and it often refers to other manuals for essential operational steps. It also has misspellings and uses bad grammar. And the program will hold only a limited amount of information about each employee.

Compumax, offers an inexpensive, limited payroll program for a wide variety of machines. Called Micropers, this package is expected to double as a personnel information system for a small business. However, it has many limitations: It only handles hourly employees on a

VENDOR GUIDE

Company	System Required	Price
BPI Systems (Distributed by Apple) 1600 W. 38th St. Suite 444 Austin, TX 78731 (512) 454-2801	48K Apple II Plus 2 disk drives with controller 80-column printer, serial or parallel	\$695
Charles Mann & Associates Micro Computer Div. 7594 San Remo Trail Yucca Valley, CA 92284 (714) 365-9718	48K Apple II Plus AppleSoft ROM 2 disk drives 132-column printer	\$360
Compumax P.O. Box 1139 Palo Alto, CA 94301 (415) 321-2881	Versions for: 48K Apple II Plus, PET, Atari, Microsoft, CP/M-CBASIC, TRS-80 I & II, Sorcerer, Superbrain, Vector Graphic, Micropolis, Dynabyte, Cromemco	\$100 to \$200
Computer Products International 3225 Danny Park Metairie, LA 70002 (504) 455-5330	Versions for: 48K Apple II Plus, 2 disk drives, 132-column printer & 12-pitch; CP/M systems; and TI 99/4 Pascal	\$595
Graham-Dorian 211 North Broadway Wichita, KS 67202 (316) 265-8633	Any CBASIC-2 and CP/M-based system	\$590
International Micro Systems 8425 Quivira Rd. Lenexa, KS 66215 (913) 888-8330	48K CP/M and MP/M OS 2 floppies with 500K minimum capacity	\$695
Lear Data 3273 Claremont Way Suite 202 Napa, CA 94558 (707) 252-7139	Any system with Cromemco Cromix operating system	\$795
Ohio Scientific 1333 South Chillicothe Rd. Aurora, OH 44202 (216) 562-3101	48K C2 or C3 OSI system and 2 disk drives, Centronics 700 series, or Okidata 22 printer	\$200
Radio Shack Computer Merchandising 700 One Tandy Center Fort Worth, TX 76102 (or any of 6,000 stores and 200 computer centers)	TRS-80 Model II, 64K RAM and Line Printer III	\$399
Retail Sciences Peachtree Software Three Corporate Square Suite 700 Atlanta, GA 30329 (404) 325-8533	Any 48K 8080, 8085 or Z-80 system with 2 disk drives, CP/M and Microsoft BASIC, 24 x 80 video display and 132-column printer	\$530
Serendipity Systems 225 Elmira Rd. Ithaca, NY 14850 (607) 277-4889	Any 32K 808/8085 or Z-80 system, one mini-floppy, Diablo printer or equivalent Cromemco, North Star extended BASIC or CBASIC	\$795
Small Business Systems Group Main Street and Lowell Road Dunstable, MA 01827 (617) 649-9595	TRS-80 Models I, II and III, 1 to 4 disk drives, 132-column printer	\$125 to \$225
Structured Systems Group 5208 Claremont Ave. Oakland, CA 94618 (415) 547-1567	Any 56K 8080 or Z-80 system, 2 floppy drives with CP/M, 132-column printer	\$820
Taranto & Associates P.O. Box 6073 San Rafael, CA 94903 (415) 472-2670	TRS-80 Model I and II, 32K RAM, 2 disk drives, 132-column printer, job-costing version (\$399)	\$100 to \$300
Vandata 17541 Stone Ave. North Seattle, WA 98133 (206) 542-8370	Any 48K 8080/8085 or Z-80 system, one eight-inch drive or 2 mini-floppy drives, 132-column printer	\$295

weekly basis; salaried employees are handled on a biweekly basis: It has only five deduction categories: It doesn't handle local taxes at all: And its state tax table is good only for California; a user must customize all other states.

However, the program does many regular functions, including printing W-2 forms and checks, a job cost/labor cost report and a complete employee history. And it integrates to Compumax's *Microledger* general-ledger program.

Computer Products International offers two similar, yet useful and feature-packed payroll packages. One is called APPL-PAY, the other Paymaster both are for the TI 99/4 in Pascal for the Apple interfaced to the Apple Controller in AppleSoft.

CPI offers an exceptional one-year software warranty, telephone

support and an annual update service for Federal and state tax information. Each employee record includes complete hourly and salaried information, three Federal and state tax withholdings, 10 voluntary deductions, sick pay, tips and commissions, in addition to quarterly and year-to-date figures.

The program prints quarterly 941A and annual W-2 forms, along with 11 reports, including a weekly prelist worksheet, a weekly prelist audit trail, two weekly earnings registers (one by department), and a written check and voided-check register. These weekly prelistings are very valuable for finding and eliminating errors.

The program's worst flaw is that it withholds all taxes from sick pay. And it does not calculate commissions; a user must figure those by

hand and insert the figures. But it has many advantages, including the fact that it is the only one of the 15 that can be used in Canadian provinces. It also calculates user-defined local taxes.

Its manual is excellent; it relies on short, simple explanations of what a user has to do and then shows the user exactly what will appear on each screen. All of the instructions are given in easy-to-follow step-by-step fashion. It should take but a short time to learn to use this system. The manual is also one of the few that coordinate the final printed report or paycheck with the instructions; a procedure is explained with short instructions, and then the exact report is given. And all of the instructions are based on the same example.

Graham-Dorian's payroll package

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LEVEL
IV
PRODUCTS

has all of the regular features and produces the standard reports, but its manual is designed to be used by someone who is very interested in learning the internal workings of the CP/M and CBASIC-2 software, subjects that not too many payroll clerks are apt to be enthusiastic about. The manual is poorly laid out and very difficult to read. It is technical, compared with the other 15 packages, and it has grammatical errors.

The program does have some good payroll calculation options, including bonuses and commissions. Users have to enter state tax withholding schedules by hand; however, this can be done with little trouble, and the user can update them each year without paying for the new information. And once a user sorts through the technical details, the

programs are in question-and-answer format, and users respond in plain English.

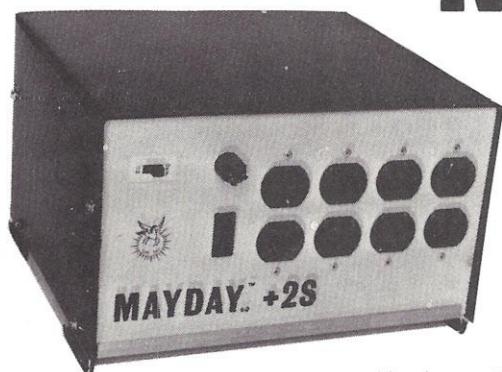
The best feature is the program's instant interactivity with the rest of the Graham-Dorian accounting system. Any single transaction can be carried through every part of the system. For example, when both the general ledger and payroll are up together, one entry to payroll is automatically posted to the ledger, giving the user a constantly current general ledger.

This package was first completed in 1978. Although it was advanced at the time, it appears that Graham-Dorian has not redesigned the software to match the more user-oriented packages being produced today.

International Micro Systems has one of the largest system capacities

in its payroll package—400 employees—and the program includes up to 12 deductions. It performs all of the standard functions, including eight reports; prints 941A and W-2 forms and checks, and simultaneously processes a two-state payroll. However, it will not directly interface with the general ledger; rather, it produces a posting register from which the entries must be put manually into the general ledger.

Lear Data offers the Tri-Star payroll program, designed to run with the Cromemco Cromix operating system and interface directly with Lear Data's own job-cost analysis program. The payroll program includes a full range of features and reports, and the manual is well-written and well laid out. However, the manual includes what seems to be an unnecessary and con-



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fusing hierarchical numbering system that is supposed to lead a user through the book. Ignoring the numbering scheme may make the manual easier for some users to understand. The numbering scheme is designed to match each frame or screen of data on a video display with the numbers in the manual. It could have been better if the screens of data were duplicated in the manual where needed. On the other hand, the manual is the only one with an index—and a very useful one at that.

The program has many one-of-a-kind features: triple-time pay rate, multiple hourly pay rates, flexible pay periods, eight Workman's Compensation classifications and three unique reports—union dues, Workmen's Compensation summary and

employee summary. Included also are a nontaxable earnings category for sick pay. Any current or potential Cromemco user should consider this program.

Ohio Scientific's Payroll/Personnel package is based on its database-management system and is very different from the other payroll packages. It has a very flexible inquiry and reporting system that allows the user to define the parameters of most of the reports he wants to print or view on the screen. The report writer can choose from 22 fields of information on an employee master file. The program also includes three math/statistical functions and seven conditionals.

The package is based on three files; payroll information with 23 fields, employee information with 15

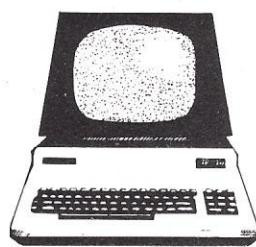
fields and a check information file with 16 information fields. Any of these can be edited and sorted by record number or by an employee's name, a function unique to this program. The program can search and sort 200 names in five minutes.

To speed check processing and printing, this package prints check stubs separately. It can also produce mailing labels, which can be used for mailing employee checks or as labels for time cards. Although it complements this special approach with most regular features, the program allows only six deductions and has a limited master file. But it does allow insertion of formulas for local and state taxes and commission earnings.

Like many early Ohio Scientific manuals, the payroll manual is fairly technical and difficult to plow

we carry it all....

commodore

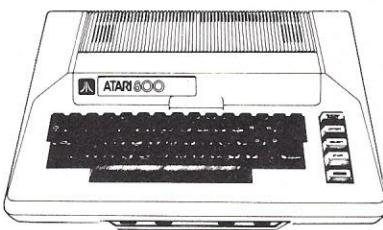


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CIRCLE 71

ledger information is transmitted at the end of a processing cycle.

The employee master file can be listed three ways: all information for all employees; personal information only; or all information for only personal information for one or more employees.

Another significant difference from most other programs is that this is one of the few that prints an employee's W-2 form as soon as the worker leaves a company.

Serendipity Systems has a limited package that does not print either W-2 forms or 941A forms, and it allows but five deductions in all, only one of which is user-definable. Its manual is fairly well written, but like Graham-Dorian's program, this one is based on program names and is harder to follow than is a menu-oriented package.

However, Serendipity includes one unique feature: it is the only package that provides for electronic-funds-transfer (EFT) deposits of paychecks directly from the company's bank to an employee's bank. It also has unique Social Security exemption and Federal withholding exemption classifications, and it provides for Federal and state unemployment insurance, disability insurance and Social Security contribution maximums.

All in all, it seems that the unique features do not balance the lack of a number of basic reports and features, such as a master file, monthly end-of-period reports and similar information. This is especially true since it is the second most expensive package on the market.

The Structured Systems Group is offering the most expensive and the most complete payroll package, but it handles relatively small numbers of employees (50) with dual floppy-drive systems. In addition to the standard deductions, it also processes local taxes, state and Federal

unemployment insurance, state disability deductions, earned income credits and special withholding allowances. Other deductions include union dues, meals, pensions, savings or other user-defined categories.

It is the only program that handles tips collected and reported, bonuses, expense reimbursements, advances, vacation pay and sick pay. It allows for any combination of regular pay schedules for active on-leave or terminated employees. It also handles commissions or piecework pay. Three of these categories can be defined for each employee; five are set for all employees.

Among the reports produced are a vacation report, an account list and pay transaction proofs. The program's employee master file can be printed in long or short form. The long form includes all information, while the short form lets you choose from a wide range of options, such as hourly employees only, salaried employees only and active or terminated only. These reports can be valuable tools.

The program's biggest drawback is its capacity limitations with small systems. However, with double-den-

sity eight-inch floppy systems, it can hold up to 300 employee files, depending on the number of monthly transactions. The manual is very easy to use and understand, and the package integrates to the rest of the Standard Systems Group accounting system.

The Small Business Systems Business Group, Taranto & Associates and Vandata all base their payroll packages on the Osborne/ McGraw-Hill version. Each company has made some minor modifications and enhancements, but the basic program remains the same in each. Among the three, the user will find the most important difference to be the supporting materials. The Small Business Systems Group provides good newsletter support, but its supporting text is poorly laid out and hard to read. Taranto sends you a copy of the Osborne manual and basically wishes you good luck, but Vandata has developed a useful manual to support its modifications.

The basic program includes under earnings categories: vacation, holiday, piecework, regular and overtime pay. Among the deductions are Federal and state unemployment taxes but very few additional categories. Most of the reports are very short, simple and of limited usefulness, compared with most of the other packages. The packages carry out most of the functions, but only their very basic elements.

Capacity is also a problem, with a maximum of 10 employees with one mini-floppy drive and a requirement of four eight-inch drives hooked up to a TRS-80 Model II to process a maximum of 250 employees.

So no one has yet written the perfect payroll program, but practically any small or medium sized business of fewer than 500 employees can find among the current crop of programs one to carry out the functions it requires.



Answer to Searchword
from page 110.

PROGRAM LISTINGS

Computer Chess This program has been written for the TRS-80 Model I and III.

continued from page 60

```

10 GOTO 140 : FOR START
20 GOTO 650 : FOR BEGINNING OF MAIN
LOOP
30 GOTO 1440 : FOR BOOK OPENINGS
40 GOTO 1960 : FOR MOVE GENERATION
50 GOTO 5850 : FOR BLACK'S MOVE DISPLAY
60 GOTO 5500 : FOR EVALUATION
SUBROUTINE
70 GOTO 5700 : FOR BLACK KING IN CHECK?
SUBROUTINE
80 GOTO 6990 : FOR WHITE KING IN CHECK?
SUBROUTINE
90 GOTO 8730 : FOR BOOK OPENING DATA
100 /
110 /
120 / INITIALIZATION
130 /
140 CLEAR 200
150 DEFINT A-Z
160 DIM C(9,9)
170 RANDOM
180 C(1,8) = -4
190 C(2,8) = -2
200 C(3,8) = -3
210 C(4,8) = -5
220 C(5,8) = -6
230 C(6,8) = -3
240 C(7,8) = -2
250 C(8,8) = -4
260 FOR X = 1 TO 8
270 C(X,7) = -1
280 C(X,2) = 1
290 NEXT X
300 C(1,1) = 4
310 C(2,1) = 2
320 C(3,1) = 3
330 C(4,1) = 5
340 C(5,1) = 6
350 C(6,1) = 3
360 C(7,1) = 2
370 C(8,1) = 4
380 BL$ = "Y"
390 BR$ = "Y"
400 WL$ = "Y"
410 WR$ = "Y"
420 BI$ = "Y"
430 MC = 1
440 PB = 0
450 CLS
460 PF$ = "N"
470 INPUT "DO YOU WANT PRINTOUT"; A$
480 A$ = LEFT$(A$, 1)
490 IF A$ = "N" GOTO 520
500 IF A$ < "Y" GOTO 450
510 PF$ = "Y"
520 CLS
530 FOR Y = 8 TO 1 STEP -1
540 PY = 64*(8 - Y)
550 FOR X = 1 TO 8
560 GOSUB 8420
570 IF CC = 1 THEN POKE PA - 1, 170
580 GOSUB 8480
590 IF CC = 1 THEN POKE PA + 2, 149
600 NEXT X
610 NEXT Y
620 /
630 /
640 / MAIN ROUTINE
650 /
660 IF MC > 9 THEN PRINT @ 704, MC;
670 IF MC < 10 THEN PRINT @ 705, MC;
680 INPUT A$
690 IF LEN(A$) < 4 GOTO 660
700 X1 = ASC(A$) - 64
710 IF X1 < 1 OR X1 > 8 GOTO 660
720 Y1 = ASC(RIGHT$(A$, 3)) - 48
730 IF Y1 < 1 OR Y1 > 8 GOTO 660
740 X2 = ASC(RIGHT$(A$, 2)) - 64
750 IF X2 < 1 OR X2 > 8 GOTO 660
760 Y2 = ASC(RIGHT$(A$, 1)) - 48
770 IF Y2 < 1 OR Y2 > 8 GOTO 660
780 WP = C(X1, Y1)
790 IF Y2 < 8 GOTO 900
800 IF WP < 1 GOTO 900
810 INPUT "WHAT PIECE DO YOU WANT"; Q$
820 Q$ = LEFT$(Q$, 1); WP = 5; WQ$ = "Q"
830 IF Q$ = "R" THEN WP = 4; WQ$ = "R"
840 IF Q$ = "B" THEN WP = 3; WQ$ = "B"
850 IF Q$ = "K" THEN WP = 2; WQ$ = "N"
860 IF Q$ = "N" THEN WP = 2; WQ$ = "N"
870 PRINT @ 768, STRING$(30, " ")
880 WQ$ = "<" + WQ$ + ">"
890 A$ = A$ + WQ$
900 C(X2, Y2) = WP
910 C(X1, Y1) = 0
920 GOSUB 8290
930 PW = 0
940 IF WP < 1 GOTO 990
950 IF Y1 < 2 GOTO 990
960 IF Y2 < 4 GOTO 990
970 IF X1 < X2 GOTO 990
980 PW = X1
990 IF Y1 < 1 GOTO 1250
1000 IF X1 < 1 GOTO 1030
1010 WL$ = "N"
1020 GOTO 1050
1030 IF X1 < 8 GOTO 1050
1040 WR$ = "N"
1050 IF X1 < 5 GOTO 1370
1060 WL$ = "N"
1070 WR$ = "N"
1080 IF Y2 < 1 GOTO 1370
1090 IF X2 < 7 GOTO 1170
1100 C(6,1) = 4
1110 C(8,1) = 0
1120 X1 = 8
1130 Y1 = 1
1140 X2 = 6
1150 Y2 = 1
1160 GOTO 1360
1170 IF X2 < 3 GOTO 1370
1180 C(4,1) = 4
1190 C(1,1) = 0
1200 X1 = 1
1210 Y1 = 1
1220 X2 = 4
1230 Y2 = 1
1240 GOTO 1360
1250 IF WP < 1 GOTO 1370
1260 IF PB = 0 GOTO 1370
1270 IF Y1 < 5 GOTO 1370
1280 IF Y2 < 6 GOTO 1370
1290 IF X2 < PB GOTO 1370
1300 IF ABS(X1 - PB) < 1 GOTO 1370
1310 C(PB, 5) = 0
1320 X = PB
1330 Y = 5
1340 GOSUB 8370
1350 GOTO 1370
1360 GOSUB 8290
1370 GOSUB 5700
1380 IF BC$ < "Y" GOTO 1420
1390 BE! = 100
1400 PRINT @ 715, "CHECK"
1410 A$ = A$ + "+"
1420 IF BC$ = "N" THEN BE! = 99:PRINT
@ 715, "
1430 IF BI$ = "N" GOTO 1960
1440 CP$ = "*"
1450 N = 0
1460 FOR Y = 8 TO 1 STEP -1
1470 FOR X = 1 TO 8
1480 IF C(X, Y) = 0 THEN N = N + 1:
GOTO 1690
1490 IF N = 0 GOTO 1530
1500 N$ = STR$(N)
1510 CP$ = CP$ + RIGHT$(N$, LEN(N$)) - 1
1520 N = 0
1530 I = C(X, Y)
1540 IF I < 0 THEN GOTO 1620
1550 IF I = 1 THEN I$ = "P":GOTO 1680
1560 IF I = 2 THEN I$ = "N"
1570 IF I = 3 THEN I$ = "B"
1580 IF I = 4 THEN I$ = "R"
1590 IF I = 5 THEN I$ = "Q"
1600 IF I = 6 THEN I$ = "K"
1610 GOTO 1680
1620 IF I = -1 THEN I$ = "T":GOTO 1680
1630 IF I = -2 THEN I$ = "S"
1640 IF I = -3 THEN I$ = "C"
1650 IF I = -4 THEN I$ = "E"
1660 IF I = -5 THEN I$ = "G"
1670 IF I = -6 THEN I$ = "M"
1680 CP$ = CP$ + I$
1690 NEXT X
1700 NEXT Y
1710 PW$ = CHR$(PW + 48)
1720 CP$ = CP$ + BL$ + BR$ + WL$ +
WR$ + PW$
1730 RESTORE
1740 READ D$
1750 IF D$ = "END" THEN BI$ = "N":
GOTO 1960
1760 IF LEFT$(D$, 1) < "*" GOTO 1740
1770 IF CP$ < D$ GOTO 1740
1780 T = 0
1790 R = RND(100)
1800 READ D$
1810 READ N$
1820 IF LEFT$(N$, 1) = "*" GOTO 1870
1830 IF N$ = "END" GOTO 1870
1840 N = VAL(N$)
1850 T = T + N
1860 IF R > T GOTO 1800
1870 X1 = ASC(D$) - 64
1880 Y1 = ASC(RIGHT$(D$, 3)) - 48
1890 X2 = ASC(RIGHT$(D$, 2)) - 64
1900 Y2 = ASC(RIGHT$(D$, 1)) - 48
1910 GOTO 5060
1920 /
1930 /
1940 / MOVE GENERATION
1950 /
1960 FOR W = 1 TO 8
1970 FOR V = 1 TO 8
1980 BP = C(V, W)
1990 IF BP >= 0 GOTO 4920
2000 C(V, W) = 0
2010 ON ABS(BP) GOTO 2060, 2500,
3270, 3810, 3270, 4300
2020 /
2030 /
2040 / PAWN MOVES
2050 /
2060 IF V = 1 GOTO 2180
2070 BX = V - 1
2080 BY = W - 1
2090 J = C(BX, BY)
2100 IF J <= 0 GOTO 2170
2110 IF W = 2 GOTO 2140
2120 C(BX, BY) = -1
2130 GOTO 2150
2140 C(BX, BY) = -5
2150 GOSUB 5500
2160 C(BX, BY) = J
2170 IF V = 8 GOTO 2280
2180 BX = V + 1
2190 BY = W - 1
2200 J = C(BX, BY)
2210 IF J <= 0 GOTO 2280
2220 IF Y = 2 GOTO 2250
2230 C(BX, BY) = -1
2240 GOTO 2260
2250 C(BX, BY) = -5
2260 GOSUB 5500
2270 C(BX, BY) = J
2280 BX = V
2290 BY = W - 1
2300 J = C(V, BY)
2310 IF J < 0 GOTO 4910
2320 IF W = 2 GOTO 2350
2330 C(V, BY) = -1
2340 GOTO 2360
2350 C(V, BY) = -5
2360 GOSUB 5500
2370 C(V, BY) = 0
2380 IF W < 7 GOTO 4910
2390 BY = W - 2
2400 J = C(V, BY)
2410 IF J < 0 GOTO 4910
2420 C(V, BY) = -1
2430 GOSUB 5500
2440 C(V, BY) = 0
2450 GOTO 4910
2460 /

```

PROGRAM LISTINGS

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2470 '
2480 ' KNIGHT MOVES
2490 '
2500 IF V > 7 GOTO 2590
2510 IF W > 6 GOTO 2590
2520 BX = V + 1
2530 BY = W + 2
2540 J = C(BX, BY)
2550 IF J < 0 GOTO 2590
2560 C(BX, BY) = -2
2570 GOSUB 5500
2580 C(BX, BY) = J
2590 IF V > 6 GOTO 2680
2600 IF W > 7 GOTO 2680
2610 BX = V + 2
2620 BY = W + 1
2630 J = C(BX, BY)
2640 IF J < 0 GOTO 2680
2650 C(BX, BY) = -2
2660 GOSUB 5500
2670 C(BX, BY) = J
2680 IF V > 6 GOTO 2770
2690 IF W < 2 GOTO 2770
2700 BX = V + 2
2710 BY = W - 1
2720 J = C(BX, BY)
2730 IF J < 0 GOTO 2770
2740 C(BX, BY) = -2
2750 GOSUB 5500
2760 C(BX, BY) = J
2770 IF V > 7 GOTO 2860
2780 IF W < 3 GOTO 2860
2790 BX = V + 1
2800 BY = W - 2
2810 J = C(BX, BY)
2820 IF J < 0 GOTO 2860
2830 C(BX, BY) = -2
2840 GOSUB 5500
2850 C(BX, BY) = J
2860 IF V < 2 GOTO 2950
2870 IF W < 3 GOTO 2950
2880 BX = V - 1
2890 BY = W - 2
2900 J = C(BX, BY)
2910 IF J < 0 GOTO 2950
2920 C(BX, BY) = -2
2930 GOSUB 5500
2940 C(BX, BY) = J
2950 IF V < 3 GOTO 3040
2960 IF W < 2 GOTO 3040
2970 BX = V - 2
2980 BY = W - 1
2990 J = C(BX, BY)
3000 IF J < 0 GOTO 3040
3010 C(BX, BY) = -2
3020 GOSUB 5500
3030 C(BX, BY) = J
3040 IF V < 3 GOTO 3130
3050 IF W > 7 GOTO 3130
3060 BX = V - 2
3070 BY = W + 1
3080 J = C(BX, BY)
3090 IF J < 0 GOTO 3130
3100 C(BX, BY) = -2
3110 GOSUB 5500
3120 C(BX, BY) = J
3130 IF V < 2 GOTO 4910
3140 IF W > 6 GOTO 4910
3150 BX = V - 1
3160 BY = W + 2
3170 J = C(BX, BY)
3180 IF J < 0 GOTO 4910
3190 C(BX, BY) = -2
3200 GOSUB 5500
3210 C(BX, BY) = J
3220 GOTO 4910
3230 '
3240 '
3250 ' BISHOP AND QUEEN MOVES
3260 '
3270 FOR M = 1 TO 7
3280 BX = V + M
3290 IF BX > 8 GOTO 3390
3300 BY = W + M
3310 IF BY > 8 GOTO 3390
3320 J = C(BX, BY)
3330 IF J < 0 GOTO 3390
3340 C(BX, BY) = BP
3350 GOSUB 5500
3360 C(BX, BY) = J
3370 IF J > 0 GOTO 3390
3380 NEXT M
3390 FOR M = 1 TO 7
3400 BX = V + M
3410 IF BX > 8 GOTO 3510
3420 BY = W - M
3430 IF BY < 1 GOTO 3510
3440 J = C(BX, BY)
3450 IF J < 0 GOTO 3510
3460 C(BX, BY) = BP
3470 GOSUB 5500
3480 C(BX, BY) = J
3490 IF J > 0 GOTO 3510
3500 NEXT M
3510 FOR M = 1 TO 7
3520 BX = V - M
3530 IF BX < 1 GOTO 3630
3540 BY = W - M
3550 IF BY < 1 GOTO 3630
3560 J = C(BX, BY)
3570 IF J < 0 GOTO 3630
3580 C(BX, BY) = BP
3590 GOSUB 5500
3600 C(BX, BY) = J
3610 IF J > 0 GOTO 3630
3620 NEXT M
3630 FOR M = 1 TO 7
3640 BX = V - M
3650 IF BX < 1 GOTO 3750
3660 BY = W + M
3670 IF BY > 8 GOTO 3750
3680 J = C(BX, BY)
3690 IF J < 0 GOTO 3750
3700 C(BX, BY) = BP
3710 GOSUB 5500
3720 C(BX, BY) = J
3730 IF J > 0 GOTO 3750
3740 NEXT M
3750 IF BP = -3 GOTO 4910
3760 GOTO 3810
3770 '
3780 '
3790 ' ROOK AND QUEEN MOVES
3800 '
3810 FOR M = 1 TO 7
3820 BX = V + M
3830 IF BX > 8 GOTO 3920
3840 BY = W
3850 J = C(BX, BY)
3860 IF J < 0 GOTO 3920
3870 C(BX, BY) = BP
3880 GOSUB 5500
3890 C(BX, BY) = J
3900 IF J > 0 GOTO 3920
3910 NEXT M
3920 FOR M = 1 TO 7
3930 BX = V
3940 BY = W - M
3950 IF BY < 1 GOTO 4030
3960 J = C(BX, BY)
3970 IF J < 0 GOTO 4030
3980 C(BX, BY) = BP
3990 GOSUB 5500
4000 C(BX, BY) = J
4010 IF J > 0 GOTO 4030
4020 NEXT M
4030 FOR M = 1 TO 7
4040 BX = V - M
4050 IF BX < 1 GOTO 4140
4060 BY = W
4070 J = C(BX, BY)
4080 IF J < 0 GOTO 4140
4090 C(BX, BY) = BP
4100 GOSUB 5500
4110 C(BX, BY) = J
4120 IF J > 0 GOTO 4140
4130 NEXT M
4140 FOR M = 1 TO 7
4150 BX = V
4160 BY = W + M
4170 IF BY > 8 GOTO 4910
4180 J = C(BX, BY)
4190 IF J < 0 GOTO 4910
4200 C(BX, BY) = BP
4210 GOSUB 5500
4220 C(BX, BY) = J
4230 IF J > 0 GOTO 4910
4240 NEXT M
4250 GOTO 4910
4260 '
4270 '
4280 ' KING MOVES
4290 '
4300 IF V > 7 GOTO 4520
4310 BX = V + 1
4320 IF W > 7 GOTO 4390
4330 BY = W + 1
4340 J = C(BX, BY)
4350 IF J < 0 GOTO 4390
4360 C(BX, BY) = -6
4370 GOSUB 5500
4380 C(BX, BY) = J
4390 BY = W
4400 J = C(BX, BY)
4410 IF J < 0 GOTO 4450
4420 C(BX, BY) = -6
4430 GOSUB 5500
4440 C(BX, BY) = J
4450 IF W < 2 GOTO 4520
4460 BY = W - 1
4470 J = C(BX, BY)
4480 IF J < 0 GOTO 4520
4490 C(BX, BY) = -6
4500 GOSUB 5500
4510 C(BX, BY) = J
4520 BX = V
4530 IF W < 2 GOTO 4600
4540 BY = W - 1
4550 J = C(BX, BY)
4560 IF J < 0 GOTO 4600
4570 C(BX, BY) = -6
4580 GOSUB 5500
4590 C(BX, BY) = J
4600 IF V < 2 GOTO 4820
4610 BX = V - 1
4620 IF W < 2 GOTO 4690
4630 BY = W - 1
4640 J = C(BX, BY)
4650 IF J < 0 GOTO 4690
4660 C(BX, BY) = -6
4670 GOSUB 5500
4680 C(BX, BY) = J
4690 BY = W
4700 J = C(BX, BY)
4710 IF J < 0 GOTO 4750
4720 C(BX, BY) = -6
4730 GOSUB 5500
4740 C(BX, BY) = J
4750 IF W > 7 GOTO 4900
4760 BY = W + 1
4770 J = C(BX, BY)
4780 IF J < 0 GOTO 4820
4790 C(BX, BY) = -6
4800 GOSUB 5500
4810 C(BX, BY) = J
4820 BX = V
4830 IF W > 7 GOTO 4900
4840 BY = W + 1
4850 J = C(BX, BY)
4860 IF J < 0 GOTO 4900
4870 C(BX, BY) = -6
4880 GOSUB 5500
4890 C(BX, BY) = J
4900 GOTO 4910
4910 C(V, W) = BP
4920 NEXT V
4930 NEXT W
4940 IF BE! < 99 GOTO 5040
4950 IF BE! = 100 THEN PRINT @ 715, "CHECKMATE"
4960 IF BE! = 99 THEN PRINT @ 715, "STALEMATE"
4970 IF PF$ < "Y" GOTO 5030
4980 0$ = STR$(MC) + " " + A$
4990 IF MC < 9 THEN 0$ = " " + 0$
5000 LPRINT 0$
5010 IF BE! = 100 THEN LPRINT "CHECKMATE"
5020 IF BE! = 99 THEN LPRINT "STALEMATE"
5030 GOTO 5020
5040 D$ = CHR$(64 + X1) +
CHR$(48 + Y1)
5050 D$ = D$ + CHR$(64 + X2) +
CHR$(48 + Y2)
5060 BP = C(X1, Y1)
5070 IF Y2 > 1 GOTO 5110

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5880 IF BP < -1 GOTO 5110
5890 BP = -5
5900 D$ = D$ + "(Q)"
5910 C(X2, Y2) = BP
5920 C(X1, Y1) = 0
5930 GOSUB 6990
5940 GOTO 5960
5950 NEXT X
5960 IF KY = 8 GOTO 6050
5970 FOR Y = KY + 1 TO 8
5980 I = C(KX, Y)
5990 IF I = 0 GOTO 6030
6000 IF I = 4 GOTO 6940
6010 IF I = 5 GOTO 6940
6020 GOTO 6040
6030 NEXT Y
6040 IF KY = 1 GOTO 6120
6050 FOR Y = KY - 1 TO 1 STEP -1
6060 I = C(KX, Y)
6070 IF I = 0 GOTO 6110
6080 IF I = 4 GOTO 6940
6090 IF I = 5 GOTO 6940
6100 GOTO 6120
6110 NEXT Y
6120 FOR N = 1 TO 8
6130 DX = KX + N
6140 IF DX > 8 GOTO 6230
6150 DY = KY + N
6160 IF DY > 8 GOTO 6230
6170 I = C(DX, DY)
6180 IF I = 0 GOTO 6220
6190 IF I = 3 GOTO 6940
6200 IF I = 5 GOTO 6940
6210 GOTO 6230
6220 NEXT N
6230 FOR N = 1 TO 8
6240 DX = KX + N
6250 IF DX > 8 GOTO 6340
6260 DY = KY - N
6270 IF DY < 1 GOTO 6340
6280 I = C(DX, DY)
6290 IF I = 0 GOTO 6330
6300 IF I = 3 GOTO 6940
6310 IF I = 5 GOTO 6940
6320 GOTO 6340
6330 NEXT N
6340 FOR N = 1 TO 8
6350 DX = KX - N
6360 IF DX < 1 GOTO 6450
6370 DY = KY - N
6380 IF DY < 1 GOTO 6450
6390 I = C(DX, DY)
6400 IF I = 0 GOTO 6440
6410 IF I = 3 GOTO 6940
6420 IF I = 5 GOTO 6940
6430 GOTO 6450
6440 NEXT N
6450 FOR N = 1 TO 8
6460 DX = KX - N
6470 IF DX < 1 GOTO 6560
6480 DY = KY + N
6490 IF DY > 8 GOTO 6560
6500 I = C(DX, DY)
6510 IF I = 0 GOTO 6550
6520 IF I = 3 GOTO 6940
6530 IF I = 5 GOTO 6940
6540 IF I = -4 GOTO 8240
6550 IF I = -5 GOTO 8240
6560 GOTO 7180
6570 NEXT X
6580 IF KY < 3 GOTO 6610
6590 IF KY < 2 GOTO 6590
6600 I = C(KX, KY)
6610 IF I = 0 GOTO 6550
6620 IF I = 3 GOTO 6940
6630 IF I = 5 GOTO 6940
6640 GOTO 6560
6650 NEXT N
6660 IF KY < 3 GOTO 6610
6670 IF KY < 2 GOTO 6590
6680 IF C(KX - 1, KY - 1) = 1 GOTO 6940
6690 IF KY > 7 GOTO 6610
6700 IF C(KX + 1, KY - 1) = 1 GOTO 6940
6710 IF KY > 6 GOTO 6640
6720 IF KY > 7 GOTO 6640
6730 IF C(KX + 1, KY + 2) = 2 GOTO 6940
6740 IF KY > 7 GOTO 6670
6750 IF KY > 6 GOTO 6670
6760 IF C(KX + 2, KY + 1) = 2 GOTO 6940
6770 IF KY < 2 GOTO 6700
6780 IF KY > 6 GOTO 6700
6790 IF C(KX + 2, KY - 1) = 2 GOTO 6940
6800 IF KY < 3 GOTO 6730
6810 IF KY > 7 GOTO 6730
6820 IF C(KX + 1, KY - 2) = 2 GOTO 6940
6830 IF KY < 3 GOTO 6760
6840 IF C(KX - 1, KY - 2) = 2 GOTO 6940
6850 IF KY < 2 GOTO 6790
6860 IF C(KX - 2, KY - 1) = 2 GOTO 6940
6870 IF KY < 3 GOTO 6820
6880 IF C(KX - 1, KY + 1) = 6 GOTO 6940
6890 IF C(KX - 1, KY - 1) = 6 GOTO 6940
6900 IF C(KX - 1, KY) = 6 GOTO 6940
6910 IF C(KX - 1, KY + 1) = 6 GOTO 6940
6920 IF C(KX, KY + 1) = 6 GOTO 6940
6930 BC$ = "N"
6940 RETURN
6950 /
6960 /
6970 / WHITE KING IN CHECK? SUBROUTINE
6980 /
6990 IF C(KX, KY) = 6 GOTO 7090
7000 FOR X = 8 TO 1 STEP -1
7010 FOR Y = 1 TO 8
7020 IF C(X, Y) = 6 GOTO 7070
7030 NEXT Y
7040 NEXT X
7050 PRINT "WHITE KING IS NOT ON BOARD"
7060 GOTO 7060
7070 KX = X
7080 KY = Y
7090 WC$ = "Y"
7100 IF KX = 1 GOTO 7190
7110 FOR X = KX - 1 TO 1 STEP -1
7120 I = C(X, KY)
7130 IF I = 0 GOTO 7170
7140 IF I = -4 GOTO 8240
7150 IF I = -5 GOTO 8240
7160 GOTO 7180
7170 NEXT X
7180 IF KX = 8 GOTO 7260
7190 FOR X = KX + 1 TO 8
7200 I = C(X, KY)
7210 IF I = 0 GOTO 7250
7220 IF I = -4 GOTO 8240
7230 IF I = -5 GOTO 8240
7240 GOTO 7260
7250 NEXT X
7260 IF KY = 8 GOTO 7350
7270 FOR Y = KY + 1 TO 8
7280 I = C(KX, Y)
7290 IF I = 0 GOTO 7330
7300 IF I = -4 GOTO 8240
7310 IF I = -5 GOTO 8240
7320 GOTO 7340
7330 NEXT Y
7340 IF KY = 1 GOTO 7420
7350 FOR Y = KY - 1 TO 1 STEP -1
7360 I = C(KX, Y)
7370 IF I = 0 GOTO 7410
7380 IF I = -4 GOTO 8240
7390 IF I = -5 GOTO 8240
7400 GOTO 7420
7410 NEXT Y
7420 FOR N = 1 TO 8
7430 DX = KX + N
7440 IF DX > 8 GOTO 7530
7450 DY = KY + N
7460 IF DY > 8 GOTO 7530
7470 I = C(DX, DY)
7480 IF I = 0 GOTO 7520
7490 IF I = -3 GOTO 8240
7500 IF I = -5 GOTO 8240
7510 GOTO 7530
7520 NEXT N
7530 FOR N = 1 TO 8
7540 DX = KX + N
7550 IF DX > 8 GOTO 7640
7560 DY = KY - N
7570 IF DY < 1 GOTO 7640
7580 I = C(DX, DY)
7590 IF I = 0 GOTO 7630
7600 IF I = -3 GOTO 8240
7610 IF I = -5 GOTO 8240
7620 GOTO 7640
7630 NEXT N
7640 FOR N = 1 TO 8
7650 DX = KX - N
7660 IF DY < 1 GOTO 7750
7670 DY = KY - N
7680 IF DY < 1 GOTO 7750
7690 I = C(DX, DY)
7700 IF I = 0 GOTO 7740
7710 IF I = -3 GOTO 8240

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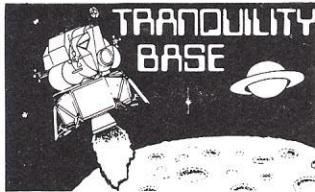


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CIRCLE 74

TERMINALS FROM TRANSNET

PURCHASE PLAN • 12-24 MONTH FULL OWNERSHIP PLAN • 36 MONTH LEASE PLAN

	DESCRIPTION	PURCHASE PRICE	PER MONTH 12 MOS.	24 MOS.	36 MOS.
DEC	LA36DECwriter II	\$1,095	\$105	\$58	\$40
	LA34 DECwriter IV	995	95	53	36
	LA34 DECwriter IV Forms Ctrl.	1,095	105	58	40
	LA120 DECwriter III KSR	2,295	220	122	83
	LA120 DECwriter III RO	2,095	200	112	75
	VT100 CRT DECscope	1,595	153	85	58
	VT132 CRT DECscope	1,995	190	106	72
TEXAS INSTRUMENTS	T1745 Portable Terminal	1,595	153	85	58
	T1765 Bubble Memory Terminal	2,595	249	138	93
	T1 Insight 10 Terminal	945	90	53	34
	T1785 Portable KSR, 120 CPS	2,395	230	128	86
	T1787 Portable KSR, 120 CPS	2,845	273	152	102
	T1810 RO Printer	1,895	182	102	69
	T1820 KSR Printer	2,195	211	117	80
DATAMEDIA	DT80/1 CRT Terminal	1,695	162	90	61
	DT80/5 APL CRT	2,095	200	112	75
	DT80/5L APL 15° CRT	2,295	220	122	83
LEAR SIEGLER	ADM3A CRT Terminal	875	84	47	32
	ADM31CRT Terminal	1,450	139	78	53
	ADM42 CRT Terminal	2,195	211	117	79
HAZELTINE	1420 CRT Terminal	945	91	51	34
	1500 CRT Terminal	1,095	105	58	40
	1552 CRT Terminal	1,295	125	70	48
TELEVIDEO	920 CRT Terminal	895	86	48	32
	950 CRT Terminal	1,075	103	57	39
NEC SPINWRITER	Letter Quality, 55/15 RO	2,895	278	154	104
	Letter Quality, 55/25 KSR	3,295	316	175	119
QUME	Letter Quality KSR, 55 CPS	3,395	326	181	123
	Letter Quality RO, 55 CPS	2,895	278	154	104
HEWLETT PACKARD	2621A CRT Terminal	1,595	153	85	58
	2621P CRT Terminal	2,750	263	154	99
CENTRONICS	730 Desk Top Printer	715	69	39	26
	737 W/P Desk Top Printer	895	86	48	32

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PROGRAM LISTINGS

```

7720 IF I = -5 GOTO 8240    8210 IF C(KX - 1, KY + 1) =
7730 GOTO 7750    -6 GOTO 8240
7740 NEXT N    8220 IF C(KX, KY + 1) =
7750 FOR N = 1 TO 8    -6 GOTO 8240
7760 DX = KX - N    8230 WC$ = "N"
7770 IF DX < 1 GOTO 7860    8240 RETURN
7780 DY = KY + N    8250 /
7790 IF DY > 8 GOTO 7860    8260 /
7800 I = C(DX, DY)    8270 / DISPLAY SUBROUTINES
7810 IF I = 0 GOTO 7850    8280 /
7820 IF I = -3 GOTO 8240    8290 X = X1
7830 IF I = -5 GOTO 8240    8300 Y = Y1
7840 GOTO 7860    8310 GOSUB 8370
7850 NEXT N    8320 X = X2
7860 IF KY > 6 GOTO 7910    8330 Y = Y2
7870 IF KX < 2 GOTO 7900    8340 GOSUB 8370
7880 IF C(KX - 1, KY + 1) =    8350 RETURN
-1 GOTO 8240    8360 /
7890 IF KX > 7 GOTO 7910    8370 PY = 64*(8 - Y)
7900 IF C(KX + 1, KY + 1) =    8380 GOSUB 8420
-1 GOTO 8240    8390 GOSUB 8480
7910 IF KY > 6 GOTO 7940    8400 RETURN
7920 IF KX > 7 GOTO 7940    8410 /
7930 IF C(KX + 1, KY + 2) =    8420 PX = 3*X + 20
-2 GOTO 8240    8430 PA = PX + PY + 15360
7940 IF KY > 7 GOTO 7970    8440 Q! = (X + Y)/2
7950 IF KX > 6 GOTO 7970    8450 IF Q! = INT(Q!) =
7960 IF C(KX + 2, KY + 1) =    THEN CC = 0 ELSE CC = 1
-2 GOTO 8240    8460 RETURN
7970 IF KY < 2 GOTO 8000    8470 /
7980 IF KX > 6 GOTO 8000    8480 I = C(X, Y)
7990 IF C(KX + 2, KY - 1) =    8490 IF I = 0 GOTO 8620
-2 GOTO 8240    8500 IF I < 0 GOTO 8530
8000 IF KY < 3 GOTO 8030    8510 POKE PR, 87
8010 IF KX > 7 GOTO 8030    8520 GOTO 8540
8020 IF C(KX + 1, KY - 2) =    8530 POKE PA, 66
-2 GOTO 8240    8540 I = ABS(I)
8030 IF KY < 3 GOTO 8060    8550 IF I = 1 THEN POKE PR + 1, 80:
8040 IF KX < 2 GOTO 8060    8560 GOTO 8680
8050 IF C(KX - 1, KY - 2) =    8570 IF I = 2 THEN POKE PR + 1, 78
-2 GOTO 8240    8580 IF I = 3 THEN POKE PR + 1, 66
8060 IF KY < 2 GOTO 8090    8590 IF I = 4 THEN POKE PR + 1, 82
8070 IF KX < 3 GOTO 8090    8600 IF I = 5 THEN POKE PR + 1, 81
8080 IF C(KX - 2, KY - 1) =    8610 GOTO 8680
-2 GOTO 8240    8620 IF CC = 1 GOTO 8660
8090 IF KY > 7 GOTO 8120    8630 POKE PR, 128
8100 IF KX < 3 GOTO 8120    8640 POKE PA + 1, 128
8110 IF C(KX - 2, KY + 1) =    8650 GOTO 8680
-2 GOTO 8240    8660 POKE PR, 191
8120 IF KY > 6 GOTO 8150    8670 POKE PR + 1, 191
8130 IF KX < 2 GOTO 8150    8680 RETURN
8140 IF C(KX - 1, KY + 2) =    8690 /
-2 GOTO 8240    8700 /
8150 IF C(KX + 1, KY + 1) =    8710 / BOOK OPENINGS DATA
-6 GOTO 8240    8720 /
8160 IF C(KX + 1, KY) =    8730 DATA *ESCGMCSETTTTTTT20
-6 GOTO 8240    P11PPP1PPPRNBNQBNRYYYYY5
8170 IF C(KX + 1, KY - 1) =    8740 DATA C7C5, 50, E7E5
-6 GOTO 8240    8750 DATA *ESCGMCSETTTTTTT19
8180 IF C(KX, KY - 1) =    P12PPP1PPPRNBNQBNRYYYYY4
-6 GOTO 8240    8760 DATA D7D5, 50, G8F6
8190 IF C(KX - 1, KY - 1) =    8770 DATA *ESCGMCSETTT1TTT12
-6 GOTO 8240    T7P8N2PPPP1PPPRNBNQKB1RYYYYY0
8200 IF C(KX - 1, KY) =    8780 DATA B8C6
-6 GOTO 8240    8790 DATA END

```

Lease/Buy

continued from page 70

This program has been written for the TRS-80 Model I.

```

100   'XXXXXXXXXXXXXXXXXXXXXXXXXXXX
110   ' LEASE/BUY ANALYSIS  *
120   '                               *
130   ' COPYRIGHT (C) 1980  *
140   '                               *
150   ' DUANE R. HOPE  *
160   '                               *
170   'XXXXXXXXXXXXXXXXXXXXXXXXXXXX
180   DEFINTR
190   DIM R(20)
200   CLS:PRINT TAB(15)      *LEASE      /      BUY
ANALYSIS":PRINT:AE=0:AL=0

```

```

210  GOSUB340  'GET GENERAL INPUTS
220  GOSUB540  'GET BUY INPUTS
230  GOSUB630  'ANALYZE BUY ALTERNATIVE
240  GOSUB2220  'DETERMINE IF BUY WHAT-IF ANALYSIS DESIRED
250  GOSUB2400  'GET LEASE INPUTS
260  GOSUB2490  'ANALYZE LEASE ALTERNATIVES
270  GOSUB2880  'DETERMINE IF LEASE WHAT-IF
ANALYSIS DESIRED
280  PRINT"ANOTHER CASE (Y/N)?";:GOSUB300 :
IF A$="Y" GOTO200
290  END
300  '***** *
310  ' INKEY$ ROUTINE *
320  '***** *
330  A$=INKEY$:IF A$="" GOTO330 ELSE PRINT A$:RETURN
340  '***** *
350  ' GET GENERAL INPUTS *
360  '***** *
370  T=-1  ' GENERAL INPUTS
380  GOSUB3060  'INPUT ROUTINE
390  FOR J=1 TO X
400  IF Q(J) ON Q(J) GOSUB3200 ,3210 ,3220 ,3240 ,3260
410  NEXT J
420  F0$=-
430  LPRINTTAB(13)"L E A S E - B U Y A N A L Y S I S "
440  LPRINT " "
450  LPRINT F0$;F0$
460  LPRINTTAB(31-LEN(NA$)/2) NA$
470  LPRINT " "
480  LPRINT"DATE PREPARED :";TD$;
490  LPRINTTAB(39)"DISCOUNT FACTOR:";DP*100;"%"
500  LPRINT"PROJECT LENGTH :";MID$(STR$(PL),2,1);" YEARS";
510  LPRINTTAB(39)"FED. TAX RATE :";TR*100;"%"
520  LPRINT F0$;F0$
530  RETURN
540  '***** *
550  ' GET BUY INPUTS *
560  '***** *
570  T= -2
580  GOSUB3060
590  FOR J=1 TO X
600  IF Q(J) PRINT J;".";: ON Q(J) GOSUB3310 ,3320
,3420
610  NEXT J
620  RETURN
630  '***** *
640  ' ANALYSIS OF BUY ALTERNATIVES *
650  '***** *
660  AB=AB+1
670  GOSUB770  ' CALCULATE DEPRECIATION
680  GOSUB1240  ' CALCULATE PRINCIPAL & INTEREST ON LOAN
690  GOSUB1520  ' CALCULATE TAXSHIELD
700  GOSUB1600  ' DETERMINE ITC AND TERMINAL INFLOWS
710  GOSUB1700  ' CALCULATE OUTFLOWS AND DCF
720  GOSUB1780  ' PRINT BUY ANALYSIS
730  RETURN
740  '***** *
750  ' CALCULATE DEPRECIATION *
760  '***** *
770  IF DM=1 GOSUB840  ' CALCULATE STRAIGHT-LINE
780  IF DM=2 GOSUB980  ' CALCULATE S.O.Y.D.
790  IF DM=3 GOSUB1130  ' CALCULATE DECLINING BALANCE
800  RETURN
810  '***** *
820  ' CALCULATE STRAIGHT-LINE DEPRECIATION *
830  '***** *
840  DA#=FA#-SV#  ' AMOUNT TO DEPRECIATE
850  AD#=ABS(DA#/PL)  ' ANNUAL DEPRECIATION
860  TD#=0  ' TOTAL DEPRECIATION
870  BV#=DA#  ' BOOK VALUE
880  FOR I=1 TO PL
890  IF BV#<AD# THEN AD#=BV#
900  BP(I,1)=AD#  ' DEPRECIATION FOR YEAR I
910  TD#=TD#+AD#
920  BV#=BV#-AD#
930  NEXT I
940  IF PL=DL AND BV#>0 THEN BP(I-1,1)=BP(I-1,1)+BV#:BV#=0
950  RETURN
960  '***** *
970  ' CALCULATE S.O.Y.D. DEPRECIATION *
980  '***** *
990  DA#=FA#-SV#
1000  BV#=DA#
1010  DD=0
1020  FOR I=1 TO DL:DD=DD+I:NEXTI
1030  FOR I=1 TO PL
1040  BP(I,1)=DA# * (DL-I+1)/DD
1050  BV#=BV#-BP(I,1)
1060  NEXT I
1070  IF PL=DL AND BV#<0 THEN BP(I-1,1)=BP(I-1,1)+BV#:BV#=0
1080  RETURN
1090  '***** *
1100  ' CALCULATE DECLINING BALANCE DEPRECIATION *
1110  '***** *
1120  FOR I=1 TO PL:BP(I,1)=0:NEXT I  ' INIT DEPRECIATION
1130  DR=1/PL * DB *.01  ' DECLINING BALANCE RATE
1140  BV#=FA#
1150  FOR I=1 TO PL
1160  BP(I,1)=BV# * DR
1170  BV#=BV#-BP(I,1)
1180
1190  BV#<SV# THEN BP(I,1)=BP(I,1)-(SV#-BV#):BV#=SV#:GOTO1200
1200  NEXT I
1210  '***** *
1220  ' CALCULATE PRINCIPAL & INTEREST ON LOAN *
1230  '***** *
1240  AE=0  ' ANNUAL EQUITY PAID
1250  AF=0  ' ANNUAL LOAN PAYMENTS
1260  AI=0  ' ANNUAL INTEREST PAID
1270  SU=0  ' ACCUMULATED PRINCIPAL
1280  AM=FA#  ' LOAN AMOUNT
1290  TP=FL*NP  ' TOTAL NO. OF PAYMENTS
1300  MI=IR/NP  ' MONTHLY INTEREST RATE
1310  V=(1+MI)*TP
1320  LP=(MI*VXFA#)/(V-1)  ' MONTHLY LOAN PAYMENT
1330  LP=INT(LP*100)/100
1340  FOR I=1 TO FL
1350  FOR J=1 TO NP
1360  IP=INT(MI*AM*100)/100
1370  PP=LP-IP
1380  AM=AM-PP
1390  SU=SU+PP
1400  AE=AE+PP
1410  AI=AI+IP
1420  AP=AP+LP
1430  NEXT J
1440  IF I=FL AND SU<FA# THEN AP=AP+FA#-SU:AE=AE+FA#-SU
1450  BP(I,2)=AI:BP(I,6)=AE:BP(I,7)=AP
1460  AE=0:AI=0:AP=0
1470  NEXT I
1480  RETURN
1490  '***** *
1500  ' CALCULATE TAXSHIELD *
1510  '***** *
1520  FOR I=1 TO PL
1530  BP(I,4)=BP(I,1)+BP(I,2)+BP(I,3)  ' TOTAL
OPERATING EXPENSE
1540  BP(I,5)=INT(TR*BP(I,4)*100)/100  ' TAXSHIELD
1550  NEXT I
1560  RETURN
1570  '***** *
1580  ' CALCULATE ITC AND TERMINAL INFLOWS *
1590  '***** *
1600  BP(I,B)=IC#  ' INVESTMENT TAX CREDIT
1610  BV#=FA#
1620  FOR I=1 TO PL
1630  BV#=BV#-BP(I,1)  ' NET BOOK VALUE
1640  NEXT I
1650  BP(PL,B) = (BV#-RV#)*TR + RV#  ' TERMINAL INFLOW
1660  RETURN
1670  '***** *
1680  ' CALCULATE OUTFLOWS AND DCF *
1690  '***** *
1700  FOR I=1 TO PL
1710  BP(I,9)=BP(I,3)+BP(I,7)-BP(I,5)-BP(I,B)
1720  BP(I,10)=BP(I,9)*1/(1+DP)*EI
1730  NEXT I
1740  RETURN
1750  '***** *
1760  ' PRINT ANALYSIS OF BUY ALTERNATIVE *
1770  '***** *
1780  F1$="$$,#####.##"
1790  F2$="##  #####.##  #####.##  #####.##  #####.##  #####.##  #####.##  #####.##  #####.##"
1800  F3$="%" %  #####.##  #####.##  #####.##  #####.##  #####.##  #####.##  #####.##  #####.##"
1810  F4$="##  #####.##  #####.##  #####.##  #####.##  #####.##  #####.##  #####.##  #####.##"
1820  F5$="%" %  #####.##  #####.##  #####.##  #####.##  #####.##  #####.##  #####.##  #####.##"
1830  FOR J=1 TO 10
1840  BP(0,J)=0
1850  FOR I=1 TO PL
1860  BP(0,I)=BP(0,J)+BP(I,J)

```

PROGRAM LISTINGS

```

1870 NEXT I,J
1880 LPRINTTAB(18)*BUY-PROPOSAL - ALTERNATIVE #*;AB
1890 LPRINT "
1900 LPRINT"PURCHASE VALUE :";LPRINT USING F1$;PA$#
1910 LPRINT TAB(39)"LOAN AMOUNT :";LPRINT USING F1$;FA$#
1920 LPRINT"DEPRECIATION METHOD#";DM$#
1930 LPRINT TAB(39)"LOAN PERIOD :";FL#; YEARS"
1940 LPRINT"ASSET LIFE :";DL#; YEARS"
1950 LPRINT TAB(39)"INTEREST RATE:";IR*100;"% ANNUAL"
1960 LPRINT"SAVAGE VALUE :";LPRINT USING F1$;SV$#
1970 LPRINT TAB(39)"PAYMENTS/YR :";NP
1980 LPRINT"RESIDUAL VALUE :";LPRINT USING F1$;RV$#
1990 LPRINT TAB(39)"ESCALATION :";ER*100;"%"
2000 LPRINT "
2010 LPRINT TAB(23)"T A X S H I E L D "
2020 LPRINT "
2030 LPRINT"YEAR DEPREC. INTEREST OPER.EXP.
TOTAL EXP. TAXSHIELD"
2040 LPRINT "
2050 FOR I=1 TO PL
2060 LPRINT
USING F2$;I,BP(I,1),BP(I,2),BP(I,3),BP(I,4),BP(I,5)
2070 NEXT I
2080 LPRINT "
2090 LPRINT
USING F3$;"TOT",BP(0,1),BP(0,2),BP(0,3),BP(0,4),BP(0,5)
2100 LPRINT "
2110 LPRINT TAB(24)"O U T F L O W S"
2120 LPRINT "
2130 LPRINT"YEAR P & I OPER.EXP. TAXSHIELD
ITC & TI OUTFLOW D.C.F."
2140 LPRINT "
2150 FOR I=1 TO PL
2160 LPRINT
USING F4$;I,BP(I,7),BP(I,3),BP(I,5),BP(I,8),BP(I,9),BP(I,10)
2170 NEXT I
2180 LPRINT "
2190 LPRINT
USING F5$;"TOT",BP(0,7),BP(0,3),BP(0,5),BP(0,8),BP(0,9),BP(0,10)
2200 LPRINT F0$;F0$
2210 RETURN
2220 '*****'
2230 ' BUY WHAT-IF ANALYSIS '
2240 '*****'
2250 PRINT"WHAT-IF ANALYSIS DESIRED (Y/N)?";:GOSUB300
2260 IF A$<"Y" AND A$>"N" THEN 2250
2270 IF A$="N" THEN RETURN
2280 FOR I=1 TO X
2290 Q(I)=0 ' INITIALIZE QUESTION TABLE
2300 NEXT I
2310 INPUT"ENTER DESIRED QUESTION NO. (0=DONE)";I
2320 IF I=0 GOTO2360
2330 IF I>0 AND I <=X THEN Q(I)=I
2340 GOTO2310
2350 '
2360 Q(0)=0:FOR I=1 TO X:Q(0)=Q(0)+Q(I):NEXT I
2370 IF Q(0) GOSUB590 :GOSUB630 ' RE-ANALYZE
BUY ALTERNATIVE
2380 GOTO2250
2390 RETURN
2400 '*****'
2410 ' GET LEASE INPUTS '
2420 '*****'
2430 T=-3
2440 GOSUB3060
2450 FOR J=1 TO X
2460 IF Q(J) PRINT J;.*;:ON Q(J) GOSUB3B70 ,3990 ,4140
2470 NEXT J
2480 RETURN
2490 '*****'
2500 ' ANALYZE LEASE ALTERNATIVES '
2510 '*****'
2520 ' CALCULATE TAX SHIELD, OUTFLOWS & DCF
2530 AL=AL+1
2540 FOR I=1 TO PL
2550 LP(I,3)=TR *( LP(I,1)+LP(I,2) )
2560 LP(I,5)=LP(I,1)+LP(I,2)-LP(I,3)-LP(I,4)
2570 LP(I,6)=LP(I,5)*1/(1+DP)EI
2580 NEXT I
2590 FOR J=1 TO 6
2600 LP(0,J)=0
2610 FOR I=1 TO PL
2620 LP(0,J)=LP(0,J)+LP(I,J)
2630 NEXT I,J
2640 LPRINT "
2650 LPRINTTAB(17)*LEASE-PROPOSAL - ALTERNATIVE #*;AL
2660 LPRINT "
2670 LPRINT"LEASE ESCALATION :";LE*100;"%";
```

```

2680 LPRINTTAB(39)"EXPENSE ESCALATION:";EE*100;"%"
2690 LPRINT "
2700 LPRINT"YEAR PAYMENT OPER.EXP. TAXSHIELD I T C
";
2710 LPRINT"OUTFLOW D.C.F."
2720 LPRINT "
2730 FOR I=1 TO PL
2740 LPRINT
USING F4$;I,LP(I,1),LP(I,2),LP(I,3),LP(I,4),LP(I,5),LP(I,6)
2750 NEXT I
2760 LPRINT "
2770 LPRINT
USING F5$;"TOT",LP(0,1),LP(0,2),LP(0,3),LP(0,4),LP(0,5),LP(0,6)
2780 LPRINT F0$;F0$
2790 LPRINT "
2800 LPRINT"BUY DCF:";LPRINT
USING "$,$,*****,$,$";BP(0,10)
2810 LPRINT"LEASE DCF:";LPRINT
USING "$,$,*****,$,$";LP(0,6)
2820 LPRINT "
2830 LPRINT"CONCLUSION - ";
2840 IF BP(0,10)< LP(0,6) LPRINT"BUY IS BETTER THAN LEASE"
2850 IF BP(0,10)> LP(0,6) LPRINT"LEASE IS BETTER THAN BUY"
2860 IF BP(0,10)= LP(0,6) LPRINT"BUY AND LEASE ARE THE SAME"
2870 RETURN
2880 '*****'
2890 ' LEASE WHAT-IF ANALYSIS '
2900 '*****'
2910 PRINT"WHAT-IF ANALYSIS DESIRED (Y/N)?";:GOSUB300
2920 IF A$<"Y" AND A$>"N" GOTO2910
2930 IF A$="N" THEN RETURN
2940 FOR I=1 TO X
2950 Q(I)=0
2960 NEXT I
2970 INPUT"ENTER DESIRED QUESTION NO. (0=DONE)";I
2980 IF I=0 GOTO3020
2990 IF I>0 AND I <=X THEN Q(I)=I
3000 GOTO2970
3010 '
3020 Q(0)=0:FOR I=1 TO X:Q(0)=Q(0)+Q(I):NEXT I
3030 IF Q(0) GOSUB2450 :GOSUB2490 ' RE-ANALYZE LEASE
3040 GOTO2910
3050 RETURN
3060 '*****'
3070 ' INPUT ROUTINE '
3080 '*****'
3090 RESTORE
3100 READ TT
3110 IF TT>T GOTO3100
3120 I=0
3130 I=I+1
3140 READ Q(I) 'READ STATEMENT NOS. OF GENERAL QUESTIONS
3150 IF Q(I)=0 THEN X=I-1 ELSE 3130
3160 RETURN
3170 '*****'
3180 ' GENERAL INPUTS '
3190 '*****'
3200 INPUT"ENTER NAME OF PROJECT";NA$:RETURN
3210 INPUT"ENTER TODAY'S DATE";TD$:RETURN
3220 INPUT"ENTER LENGTH OF PROJECT IN YEARS";PL
3230 IF PL <= 0 GOTO3220 ELSE RETURN
3240 INPUT"ENTER DISCOUNT PERCENT AS A WHOLE NUMBER";DP
3250 IF DP <= 0 OR DP > 50 GOTO3100 ELSE DP=DP/100:RETURN
3260 INPUT"ENTER INCOME TAX RATE AS A WHOLE NUMBER";TR
3270 IF TR <= 0 GOTO3260 ELSE TR=TR/100:RETURN
3280 '*****'
3290 ' BUY INPUTS '
3300 '*****'
3310 INPUT"ENTER PURCHASE VALUE";PA$:IFPA$<=0 GOTO3310
ELSE RETURN
3320 INPUT"ENTER DEPRECIATION METHOD(0=NONE 1=SL 2=SODYD
3=DB)";DM
3330 IF DM<0 OR DM>3 GOTO3320
3340 IF DM=1 THEN DM$="STRAIGHT LINE"
3350 IF DM=2 THEN DM$="S.O.Y.D."
3360 IF DM=3 THEN DM$=" X D.E.":GOTO3380
3370 RETURN
3380 INPUT"ENTER DECLINING BALANCE FACTOR";DB
3390 IF DB<=0 OR DB>200 GOTO3380
3400 DM$=STR$(DB)+DM$
3410 RETURN
3420 INPUT"ENTER DEPRECIATION LIFE OF ASSET";DL
3430 IF DL<=0 GOTO3420 ELSE RETURN
3440 INPUT"ENTER SALVAGE VALUE";SV$
3450 IF SV$<0 OR SV>PA$ GOTO3440 ELSE RETURN
3460 INPUT"ENTER RESIDUAL VALUE OF ASSET";RV$
3470 IF RV<0 OR RV>PA$ GOTO3460 ELSE RETURN

```

```

3480 PRINT"IS LENGTH OF FINANCING PERIOD";PL;"  

YEARS (Y/N)?";  

3490 GOSUB300:IF A$<>"Y"AND A$<>"N"THEN3480 ELSE  

IF A$="N" GOTO3510  

3500 FL=PL:RETURN  

3510 INPUT"ENTER LENGTH OF FINANCING IN YEARS";FL  

3520 IF FL <= 0 GOTO3510 ELSE RETURN  

3530 PRINT"IS AMOUNT TO BE  

FINANCED ";:PRINTUSING"###,###,##";PA#;:PRINT"  

(Y/N)?";:GOSUB300:IF A$<>"Y"AND A$<>"N"THEN3530 ELSE  

IF A$="N" GOTO3550  

3540 FA#=PA#:RETURN  

3550 INPUT"ENTER AMOUNT TO BE FINANCED";FA#  

3560 IF FA#<=0 GOTO3550 ELSE RETURN  

3570 INPUT"ENTER INTEREST RATE FOR LOAN AS A  

WHOLE NUMBER";IR  

3580 IF IR<=0 GOTO3570 ELSE IR=IR/100:RETURN  

3590 INPUT"ENTER NUMBER OF PAYMENTS PER YEAR";NP  

3600 IF NP<=0 OR NP>12 GOTO3590 ELSE RETURN  

3610 PRINT"ARE THERE ANY OPERATING  

EXPENSES (Y/N)?";:GOSUB300  

3620 IF A$<>"Y"AND A$<>"N" THEN3610 ELSE IF  

A$="Y" THEN3640  

3630 FOR I=1TOFL:BP(I,3)=0:NEXT I:RETURN  

3640 INPUT"ENTER ESCALATION RATE AS A  

WHOLE NUMBER(NONE=0)";ER  

3650 IF ER<0 GOTO3640 ELSE ER=ER/100  

3660 PRINT"ENTER YEAR, EXPENSES";:GOTO3680  

3670 PRINT"ENTER CHANGE YEAR, EXPENSES (NONE=0,0)";  

3680 INPUT Y,E  

3690 IF Y=0 AND E=0 GOTO3750  

3700 FOR I=Y TO PL  

3710 BP(I,3)=E  

3720 E=E*(1+ER)  

3730 NEXT I  

3740 IF Y>PL GOTO3670  

3750 RETURN  

3760 PRINT"ENTER ITC AS RATE OR AMOUNT (R=RATE  

A=AMOUNT Q=NONE)?";:GOSUB300  

3770 IF A$<>"R"AND A$<>"A" AND A$<>"Q" GOTO3760  

3780 IF A$="Q" THEN IC#=0:RETURN  

3790 IF A$="R" GOTO3810  

3800 INPUT"ENTER ITC AMOUNT";IC#:RETURN
3810 INPUT"ENTER ITC RATE AS A PERCENT";IC#  

3820 IC#=IC#/100*PA#  

3830 RETURN  

3840 '*****  

3850 ' LEASE INPUTS *  

3860 '*****  

3870 INPUT"ENTER AMOUNT OF LEASE PAYMENTS FOR FIRST  

YEAR";LA#  

3880 IF LA# <= 0 GOTO3870 ELSE Y=1  

3890 INPUT"ENTER ESCALATION RATE FOR LEASE (NONE=0)";LE  

3900 IF LE<0 AND LE>1 GOTO3880 ELSE LE=LE/100:GOTO3920  

3910 INPUT"ENTER CHANGE YEAR, LEASE PAYMENT  

(NONE=0,0)";Y,LA#  

3920 IF Y=0 AND LA#=0 GOTO3980  

3930 FOR I=Y TO PL  

3940 LP(I,1)=LA#  

3950 LA#=LA#*(1+LE)  

3960 NEXT I  

3970 IF Y<PL GOTO3910  

3980 RETURN  

3990 PRINT"ARE THERE ANY LESSEE PAID OPERATING EXPENSES  

(Y/N)?";:GOSUB300  

4000 IF A$<>"Y" AND A$<>"N" THEN3990 ELSE IF  

A$="Y" THEN4020  

4010 FOR I=1 TO PL:LP(I,2)=0:NEXT I:RETURN  

4020 INPUT"ENTER ESCALATION RATE AS A WHOLE  

NUMBER(NONE=0)";EE  

4030 IF EE<0 AND EE>1 GOTO4020 ELSE EE=EE/100  

4040 PRINT"ENTER YEAR, EXPENSES";:GOTO4060  

4050 PRINT"ENTER CHANGE YEAR, EXPENSES (NONE=0,0)";  

4060 INPUT Y,E  

4070 IF Y=0 AND E=0 GOTO4130  

4080 FOR I=Y TO PL  

4090 LP(I,2)=E  

4100 E=E*(1+EE)  

4110 NEXT I  

4120 IF Y>PL GOTO4050  

4130 RETURN  

4140 INPUT"ENTER AMOUNT OF ITC RECEIVED BY LESSEE(NONE=0)  

";LC#  

4150 IF LC# < 0 GOTO4140 ELSE LP(1,4)=LC#:RETURN  

4160 DATA -1,1,2,3,4,5,0,-2,1,2,3,4,5,6,7,8,9,10,11,  

0,-3,1,2,3,0

```

Making Math Fun This program has been written in TRS-80 Level II BASIC.

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```

10 CLS:PRINTCHR$(23)  

15 A$="<**><**><**><**>"  

20 R$(1)=CHR$(128)+CHR$(174)+CHR$(187)+CHR$(187)+CHR$(132)  

21 R$(2)=CHR$(128)+CHR$(156)+CHR$(190)+CHR$(156)+CHR$(148)  

22 R$(3)=CHR$(128)+CHR$(177)+CHR$(151)+CHR$(181)+CHR$(145)  

23 R$(4)=CHR$(128)+CHR$(166)+CHR$(183)+CHR$(191)+CHR$(132)  

24 R$(5)=CHR$(128)+CHR$(174)+CHR$(183)+CHR$(183)+CHR$(132)  

50 PRINT:PRINT:PRINT:A$  

60 PRINTTAB(7);"FRACTION BLOWOUT":PRINT:  

PRINTTAB(10);"ESTIMATION":PRINT  

65 PRINTA#  

70 FORTM=1TO1500:NEXT  

100 CLS  

105 PRINTTAB(24);"FRACTION BLOWOUT":PRINT  

110 PRINT" AN EVIL ROBOT IS ATTEMPTING TO CROSS THE  

BRIDGE. TRY YOUR HAND AT BLOWING UP THE BRIDGE TO  

STOP THE ROBOT. THE COMPUTER"  

115 PRINT" HAS HIDDEN SOME EXPLOSIVES UNDER THE BRIDGE. YOU  

TRY TO FIND IT. THE BRIDGE REPRESENTS THE NUMBER  

LINE BETWEEN ZERO AND"  

120 PRINT"ONE. THE LEFT SIDE IS ZERO, THE RIGHT SIDE IS  

ONE. YOU ARE SHOWN WHERE THE EXPLOSIVES ARE HIDDEN  

BY THE FRACTION"  

125 PRINT"AT THE TOP OF THE SCREEN. YOU MANEUVER THE  

DETONATOR TO THE RIGHT OR LEFT BY PRESSING ->  

OR <- , WHEN YOU HAVE"  

130 PRINT"POSITIONED IT SO THAT IT IS BELOW WHERE YOU THINK  

THE EXPLOSIVES ARE HIDDEN THEN PRESS <SPACE BAR>.  

IF YOU ARE"  

135 PRINT"CORRECT THE BRIDGE WILL BE DESTROYED. IF YOU ARE  

WRONG THE COMPUTER WILL TELL YOU IF YOU ARE TOO FAR  

TO THE RIGHT OR LEFT."  

140 PRINT:INPUT"PRESS <ENTER> TO CONTINUE ";Z$  

145 CLS  

150 PRINT"IT TAKES THE ROBOT 10 MOVES TO GO ACROSS THE  

BRIDGE. THE TWO:PRINT"OF YOU WILL TAKE TURNS TRYING TO  

DESTROY THE BRIDGE AND DROWN"  

155 PRINT"THE ROBOT. WHOEVER SUCCESSFULLY DETONATES THE  

EXPLOSIVE CHARGE":PRINT"GETS THE POINTS. THE SOONER THE  

BRIDGE IS BLOWN UP, THE"  

160 PRINT"MORE POINTS YOU WILL RECEIVE. IF THE ROBOT  

SUCCESSFULLY MOVES":PRINT"ACROSS THE BRIDGE NO ONE  

RECEIVES ANY POINTS. THE FIRST ONE"  

165 PRINT"TO SCORE 21 OR MORE POINTS IS THE WINNER."  

170 PRINT:INPUT"PRESS <ENTER> TO CONTINUE ";D$  

180 PRINT:PRINT:INPUT"WHAT IS THE NAME OF THE FIRST  

PLAYER";A$(1)  

190 PRINT:INPUT"WHAT IS THE NAME OF THE SECOND PLAYER  

";A$(2)  

300 P=RND(2):S(1)=0:S(2)=0  

400 CLS  

401 P(1)=575:P(2)=639:P(3)=703:G=10  

405 PRINT#768,0;CHR$(170);:FORL=770TO828:  

PRINTL,CHR$(179);:NEXT:PRINT#829,CHR$(187);"1";  

410 GOSUB2000  

500 PRINT@0,A$(1);" = ";S(1);:PRINT#32,A$(2);" = ";S(2);  

510 D=RND(12)  

511 OND GOTO520,521,522,523,524,525,526,527,528,529,530,531  

520 D=2:GOTO535  

521 D=3:GOTO535  

522 D=4:GOTO535  

523 D=5:GOTO535  

524 D=6:GOTO535  

525 D=8:GOTO535  

526 D=10:GOTO535  

527 D=12:GOTO535

```

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Computer Games

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aliens reaches the bottom of the screen, or if the player has lost three tanks, the enemy wins.

Of the numerous personal-computer versions of Space Invaders that have appeared, most are rather decent adaptations of the public arcade game. The most popular is probably M. Hata's **Super Invaders**, published by Creative Software. It runs just like the public arcade version, but on an Apple, with wonderful invader graphics and sound effects.

Another chart buster in public arcade games has been **Asteroids**, released by Atari. The player gets a ship and is placed in the center of a swarm of moving meteorites. Every time the player fires at the moving rocks, and hits them, they splinter and vanish. In addition a small enemy spaceship appears from time to time and must also be destroyed.

Personal computer versions of this game have been slow in reaching the market. The game is graphically a lot more complicated than is Invaders, which features strictly horizontal movement and an occasional downward movement of one row. With Asteroids, however, the movement of the Asteroids on the screen seems to be random. Some move on diagonals, some horizontally and others vertically. Many programmers lost sleep trying to translate the program for home machines.

The most prominent entries have been by Adventure International and Quality Software. Quality's version, **Asteroids in Space**, has many of the features of the public arcade version but somewhat cruder graphics. The major drawback, however, is that the game is run by two paddles and occasionally a key from the keyboard, a rather cumbersome operation.

Another very popular public ar-

cade game, Galaxian—far more challenging than Invaders, because the enemy spaceships can attack over many flight paths on a screen drawn entirely in color—has led to several personal computer games. One of the best is **Apple Galaxian** by Broderbund Software. It is in every way like the public arcade game and is highly recommended for Galaxian addicts.

And speaking of addicts, there are many new Missile Command experts around these days. **Missile Command** is a new Atari release and is quite exciting to play. There are six cities and three missile sites at the bottom of the screen. Missiles start coming out of the sky from all directions aimed at the cities and missile sites. The player fires from any of the missile sites to intercept the oncoming missiles. Play continues as long as there is at least one city left. The game has rapidly established itself as a contemporary classic in arcade games and, as with all of its predecessors, has spurred a number of personal computer versions.

The most successful home version so far is **ABM** from Muse. Here the six cities are identified as Boston, New York, Philadelphia, Baltimore, Washington and Richmond. The game can be controlled by either paddles or joysticks. Paddles are somewhat awkward; the joystick version seems to be best.

What can we expect in arcade games of the near future? Well, for one thing, look for 3-D. Atari has just introduced three-dimensional holographic games in its electronic game line-up, with arcade versions in development. Obviously the hardware will be a problem for the home market, but knowing some of the programmers out there, this difficulty will be taken as a new challenge in the world of computer games. 

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two bytes of the previous line (L1 and L1+1). Again, the zero at the end of each line is used to find the beginning of the next line.

Level II uses RAM locations 16633 and 16634 to point to the end of the program. Line 55500 asks you to POKE the new end location into these bytes. You are asked to do this in the command mode. The operation is now complete and DESPACE has disappeared. A LIST will show only the compressed version of the program it was working on.

Additional comments

DESPACE is designed for 16K, Level II. If you have more than 16K, use: $-1^* (65536 \text{ minus the desired location})$ to PEEK or POKE locations above 32767. If you have a disk system, you may have to make adjustments for a different starting location for program memory. DESPACE operates fairly quickly, considering that it's written in BASIC. It takes about seven minutes to despace an 8K program.

DESPACE is designed to be appended to the end of another program. The usual procedure for this is:

1. CLOAD your main program
2. Use the command mode to enter:
 $A = \text{PEEK}(16633) + \text{PEEK}(16634)*256 - 2$: POKE 16548,
 $A - \text{INT}(A/256)*256$: POKE 16549, $\text{INT}(A/256)$
3. CLOAD DESPACE
4. POKE 16548, 233: POKE 16549, 66

DESPACE can be used on programs with line numbers higher than 55000 if you leave out step four until after you have run DESPACE. If the program you want to work on has a line number 55000, change the first line of DESPACE to a line number which is not in the other program and make the appropriate change to line 55116. 

PROGRAM LISTINGS

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```

528 D=15:GOT0535
529 D=20:GOT0535
530 D=24:GOT0535
531 D=30
535 N=RND(D-1):U1=D:U2=N
536 W=U1-U2*INT(U1/U2):IFW=0:GOT0538
537 U1=U2:U2=W:GOT0536
538 N=N/U2:D=D/U2
539 PRINT@79,"THE EXPLOSIVES ARE HIDDEN AT:"
540 PRINT@159,N;PRINT@222,"-----";PRINT@287,D
545 EX=((120/D)*N)+4
550 PRINT@920,A$(P);"'S TURN"
555 PRINT@340,"POINTS FOR A HIT = ";G
600 B=RND(100)+10
610 SET(B,39)
700 Q=PEEK(14400)
710 IFQ<32:THEN720
711 IFB<4:GOT0731
712 B=B-1:SET(B,39):RESET(B+1,39):GOT0740
720 IFQ<64:GOT0730
721 IFB>122:GOT0731
722 B=B+1:SET(B,39):RESET(B-1,39):GOT0740
730 IFQ<128:GOT0750
731 RESET(B,39):FORTM=1TO50:NEXT
732 SET(B,39):FORTM=1TO50:NEXT
740 GOT0610
750 IFB=EXGOT01000
760 RESET(B,39):RESET(B,38):G=G-1
763 GOSUB20100
770 IFB=EXGOT0790
780 PRINT@405,"TOO FAR TO THE LEFT":GOT0800
790 PRINT@405,"TOO FAR TO THE RIGHT"
800 FORTM=1TO2500:NEXT
810 FORZ=320TO447:PRINT@Z,CHR$(128);:NEXT:FORZ=896TO959:
PRINT@Z,CHR$(128);:NEXT
815 IFG=1:GOT0900
820 IFP=1:GOT0840
830 P=P-1:GOT0550
840 P=P+1:GOT0550
900 PRINT@332,"THE BLINKING DOT SHOWS YOU WHERE IT WAS."
910 FORI=1TO15:SET(EX,37):FORTM=1TO120:NEXT:RESET(EX,37):
FORTM=1TO80:NEXT:NEXT
920 FORX=12TO126:FORY=27TO35:RESET(X,Y):NEXT:NEXT
930 GOT0400
1000 FORT=1TO10:M=RND(4):N=RND(10):SET(EX+M,38-N):
SET(EX-M,38-N):SET(EX+M,38-(10-N)):SET(EX-M,38-(10-N)):
SET(EX,36-N):SET(EX+M,37-N):SET(EX-M,37-N):SET(EX+1,35-N):
SET(EX-1,35-N):SET(EX+2,34-N):SET(EX-2,34-N)
1005 SET(EX-M-1,38-N):SET(EX-M+1,39-N):SET(EX+M+1,38-N):
SET(EX-M-1,38-N):SET(EX+3,37-N-1):SET(EX-3,37-N-1)
1010 RESET(EX+M,38-N):RESET(EX-M,38-N):
RESET(EX-M,38-(10-N)):RESET(EX+M,38-(10-N)):
RESET(EX,36-N):RESET(EX+M,37-N):RESET(EX-M,37-N):
RESET(EX-1,35-N):RESET(EX+1,35-N):RESET(EX+2,34-N):
RESET(EX-2,34-N)
1015 RESET(EX+M-1,39-N):RESET(EX-M+1,39-N):
RESET(EX+M+1,38-N):RESET(EX-M-1,38-N):RESET(EX+3,37-N-1):
RESET(EX-3,37-N-1)
1020 NEXT
1040 PRINT@340,""
1050 FORT=1TO10
1055 PRINT@341,""
1060 PRINT@346,"YOU HIT IT";
1070 FORTM=1TO100:NEXT
1080 PRINT@346,""
1090 PRINT@341,"Y O U   H I T   I T";
1095 FORTM=1TO100:NEXT
1099 NEXT
1100 S$(P)=S(P)+G
1110 IFS(P)>2:GOT01200
1120 IFP=2:GOT01140
1130 P=P+1:GOT0400
1140 P=P-1:GOT0400
1200 CLS:PRINTCHR$(23):PRINT:PRINT
1210 PRINTTAB(10);A$(P);"' WINS"
1215 FORTM=1TO2000:NEXT
19999 CLS:END
20000 FORJ=1TO3:PRINT@P(J),R$(J);:NEXT:RETURN
20100 FORG=1TO5
20110 PRINT@P(1),R$(4);:FORTM=1TO30:NEXT
20120 PRINT@P(1),R$(1);:FORTM=1TO30:NEXT
20130 PRINT@P(1),R$(5);:FORTM=1TO30:NEXT
20140 PRINT@P(1),R$(1);:FORTM=1TO30:NEXT
20150 NEXT
20200 FORL=1TO6:P(1)=P(1)+1:P(2)=P(2)+1:P(3)=P(3)+1:
GOSUB2000
20205 NEXT
20210 RETURN

```

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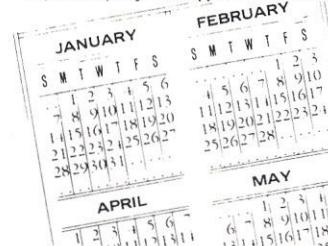
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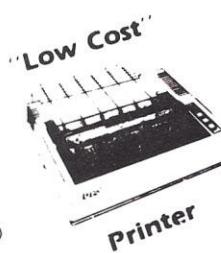
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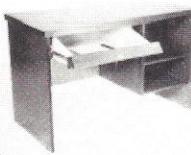
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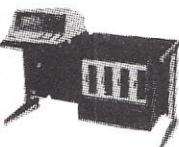
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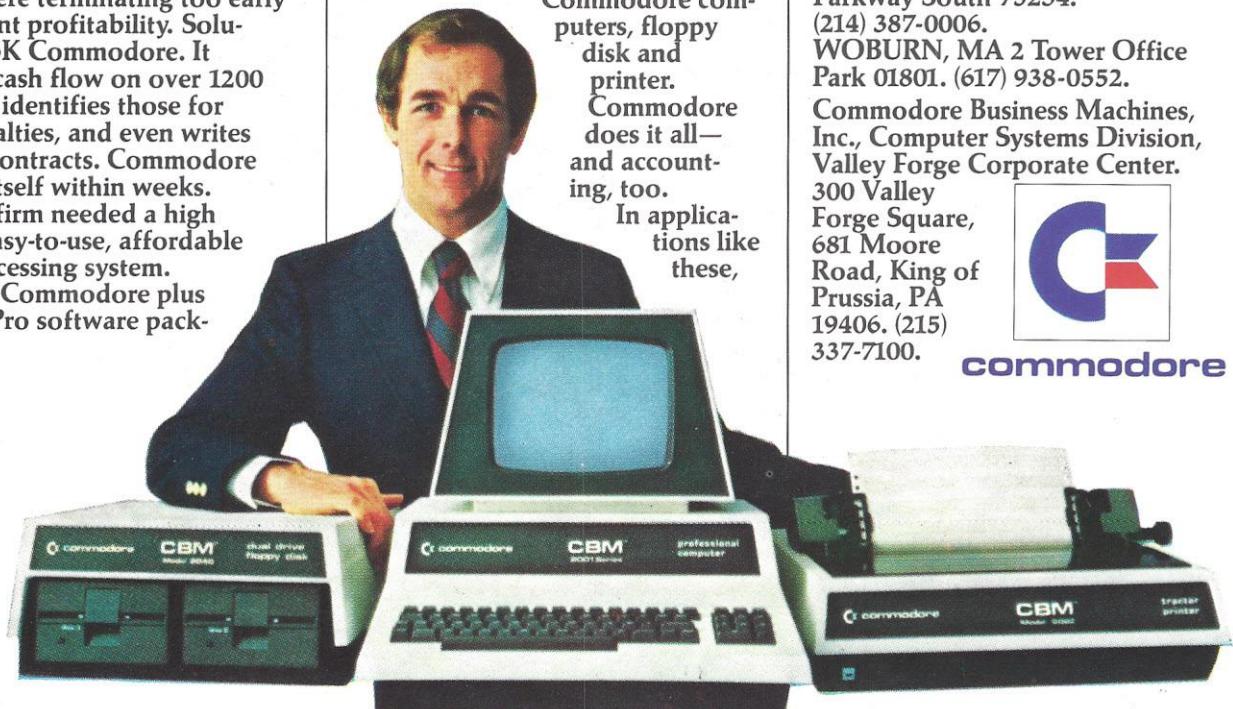
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